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Iowa Air Quality Report, 1976

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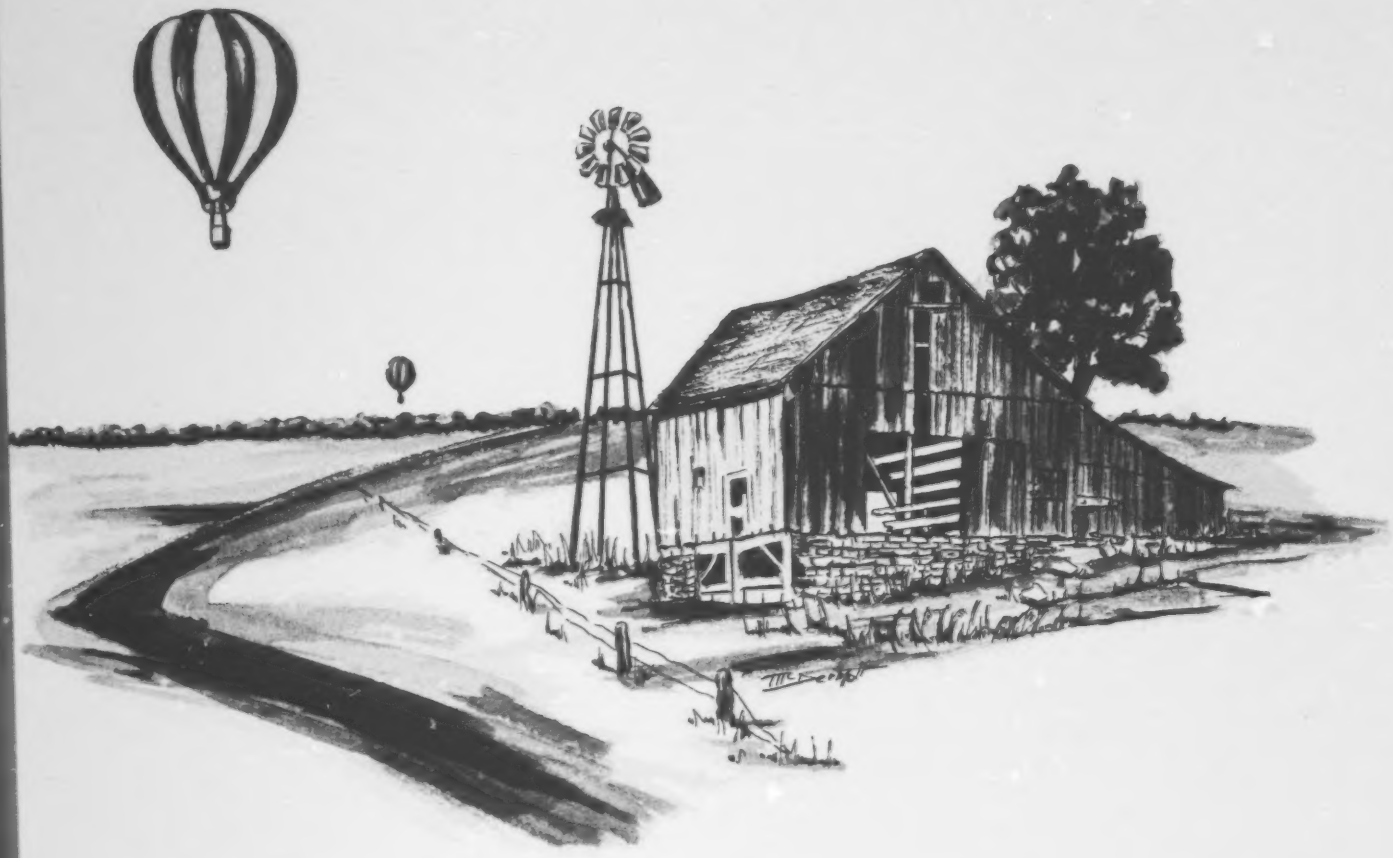

1976 Iowa Air Quality Report

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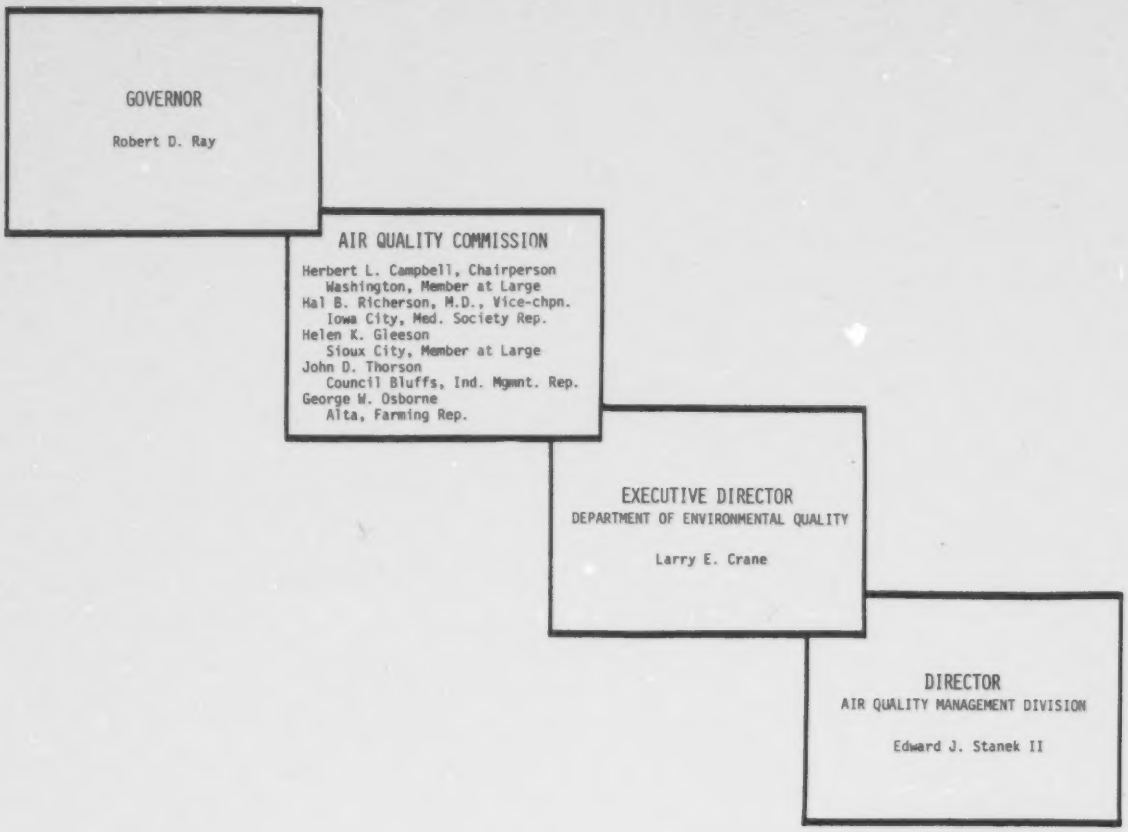
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IOWA AIR QUALITY REPORT

1976

AUGUST 1977

PREPARED BY:

AIR QUALITY MANAGEMENT DIVISION

IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY

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PREFACE

The 1976 Iowa Air Quality Report was developed by the staff of the Air Quality Management Division of the Iowa Department of Environmental Quality to inform the public of Iowa's air quality for the previous year. This manual contains a summary of air monitoring data collected in Iowa from 1957 to 1976 and more detailed analysis of data collected during 1976. Also included are summaries of special air monitoring-related projects being conducted by the Department.

The intent of this report is to supply information regarding Iowa's air quality to Iowans with a wide range of technical backgrounds and interests. Technical terminology is used in some places to provide those with an interest in air pollution chemistry the opportunity to have precise information available. Readers who have no interest in this area should find the report quite informative and less confusing by skipping over the sections which are technically complex.

The report is based upon analyses performed by the State Hygienic Laboratory, University of Iowa, Iowa City; by the Air Pollution Division of the Des Moines-Polk County Health Department; by the Air Pollution Division of the Linn County Health Department; and by the Environmental Protection Agency's National Air Surveillance Network. Monitor operation and maintenance for Scott County was conducted by the Quad Cities Regional Air Pollution Control Board, Rock Island, Illinois. Special recognition should also be given to the many local monitoring equipment operators who, in large part, volunteer their services.

We hope that this report will be both a source of information and a guide for further air quality improvement in Iowa.

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KEY

The following symbols and abbreviations will be used in this report:

AQCR	Air Quality Control Region
Arith. Mean	Arithmetic Mean
CO	Carbon Monoxide
DMPC	Des Moines-Polk County Health Department
EPA	Environmental Protection Agency
Geo. Mean	Geometric Mean
Hi-Vol	Hi-Volume Sampler
24 Hr. Std.	24-Hour Standard
LCHD	Linn County Health Department
Max	Maximum
mg/m^3	Milligrams per cubic meter
NAAQS	National Ambient Air Quality Standards
No.	Number
NO_2	Nitrogen Dioxide
PSI	Pollutant Standards Index
ppm	Parts per million
QCAP	Quad Cities Area Regional Air Pollution Control Board
SGD	Standard geometric deviation
SHL	State Hygienic Laboratory
SO_2	Sulfur Dioxide
$\mu g/m^3$	Micrograms per cubic meter
>	Is greater than
*	Do not use as annual statistics representative of air quality data for that year because four valid quarters not available.

I. AMBIENT AIR QUALITY STANDARDS

The National Ambient Air Quality Standards (NAAQS) were established by the U.S. Environmental Protection Agency in 1971, as required by the Clean Air Act of 1970. These standards were developed for six pollutants: suspended particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, hydrocarbons, and photochemical oxidants. Each standard specifies a concentration and an exposure time which were developed from research on the physiological effects of various pollutant levels.

The NAAQS for the six pollutants are separated into two categories, primary and secondary. Primary ambient air quality standards define levels of air quality which are necessary to protect the public health from adverse effects of a pollutant. Secondary ambient air quality standards, which are generally more restrictive than primary, define levels of air quality which are necessary to protect the public welfare from adverse effects of a pollutant. For some pollutants, the primary and the secondary standards are identical. Neither the primary nor secondary air quality standards, excluding annual means, are to be exceeded more than once per year. Table 1 lists the NAAQS for the six pollutants listed above.

TABLE I

NATIONAL PRIMARY AND SECONDARY
AMBIENT AIR QUALITY STANDARDS*

Suspended Particulates

Primary	Secondary	
a) 75 $\mu g/m^3$	a) 60 $\mu g/m^3$	Annual geometric mean.
b) 260 $\mu g/m3$	b) 150 $\mu g/m^3$	Maximum 24-hour concentration not to be exceeded more than once per year.

Sulfur Dioxide

Primary	Secondary	
a) 80 $\mu g/m^3$ (0.03 ppm)		Annual arithmetic mean.
b) 365 $\mu g/m^3$ (0.14 ppm)		Maximum 24-hour concentration not to be exceeded more than once per year.
	1300 $\mu g/m^3$ (0.5 ppm)	Maximum 3-hour concentration not to be exceeded more than once per year.

Carbon Monoxide

Primary and Secondary	
a) 10 mg/m^3 (9 ppm)	Maximum 8-hour concentration not to be exceeded more than once per year.
b) 40 mg/m^3 (35 ppm)	Maximum 1-hour concentration not to be exceeded more than once per year.

Photochemical Oxidants

Primary and Secondary	
160 $\mu g/m^3$ (0.08 ppm)	Maximum 1-hour concentration not to be exceeded more than once per year.

Hydrocarbons

Primary and Secondary	
160 $\mu g/m^3$ (0.24 ppm)	Maximum 3-hour concentration (6 to 9 a.m.) not to be exceeded more than once per year.

Nitrogen Dioxide

Primary and Secondary	
a) 100 $\mu g/m^3$ (0.05 ppm)	Annual arithmetic mean.

*Published in the Federal Register, Vol. 36, No. 84, Part II - Friday, April 30, 1971; Revised in the Federal Register, Vol. 38, No. 178, Part I - Friday, September 14, 1973.

II. POLLUTANT DESCRIPTIONS AND MONITORING METHODS

Suspended Particulates

Any solid or liquid matter of relatively small particle size (usually .001 to .1 millimeters) that tends to stay suspended and dispersed in the atmosphere for a significant length of time is considered a suspended particulate. Suspension time may vary from a few seconds to several months, depending on particle size. Sources of this pollutant include combustion, industrial processes, agricultural activities, and unpaved roads.

Particulate pollution has adverse affects on climate, property, vegetation and human health. Large concentrations of particulate matter promote cloud formation and reduce solar radiation, thus causing possible climate changes. Atmospheric particles may accelerate corrosion of iron, steel and various nonferrous metals, disfigure and damage building materials, and soil painted and textile surfaces. Particulates may prevent normal plant growth by intercepting light needed for photosynthesis. It has also been shown that suspended particulates will cause or promote respiratory ailments.

The method of collection consists of a high volume vacuum pump motor that is designed to continuously draw a large volume of air (1 to 2 cubic meters/min.) through a preweighed glass fiber filter for a 24-hour period (usually midnight to midnight). The sample filter is then sent to the laboratory, where it is held at least 24 hours at 75° F and less than 50% relative humidity before it is weighed again. The weight difference is the amount of particulates, measured in micrograms. Combined with the calculated volume of air that passed through the filter during the 24 hour period, the amount of suspended particulate matter can be expressed in micrograms per cubic meter. Minimum detectable limit for this method is one microgram per cubic meter.

Sulfur Oxides (Sulfur Dioxide)

Sulfur oxides are common atmospheric pollutants that consist of sulfur dioxide, sulfur trioxide, and the corresponding acids and salts (sulfites and sulfates). The most common sulfur oxide monitored is sulfur dioxide (SO_2).

Sulfur dioxide is a nonflammable, colorless gas that most people can detect by taste or odor. The largest man-made source of this pollutant is produced from combustion of solid and liquid fossil fuels. Other less significant sources are manufacturing of sulfuric acid and refining of petroleum.

Sulfur oxides have adverse effects on property, vegetation, and human health. Much of the damage to property and vegetation is due to the conversion of sulfur oxides to highly reactive sulfuric acid. This acid tends to accelerate both corrosion in metals and decay in building materials, textile fibers, leather, and other miscellaneous materials. The sulfuric acid will cause injury to leaf tissues, thus suppressing vegetative growth and yield. Sulfur oxides have also been shown to cause irritation of the human respiratory system, producing possible temporary or permanent injury.

The 24-hour sampling method collects sulfur dioxide by bubbling ambient air samples through an absorbing solution of potassium tetrachloromercurate. This collected sample is then analyzed in the laboratory by adding pararosaniline and formaldehyde which react with the complexed sulfur ion to form a red/purple color. The intensity of the color is proportional to the sulfur dioxide that was originally absorbed out of the bubbled air. This color intensity is measured spectrophotometrically and results are reported in micrograms per cubic meter. The detection limit for this method is five micrograms per cubic meter.

The continuous sulfur dioxide instrumentation method used at stations in Iowa is the Environmental Protection Agency reference method known as the coulometric method. It involves the detection of electric current differences in an electrochemical reaction. This reaction occurs in a cell containing platinum electrodes and a potassium iodide solution. Ambient air is bubbled through this detection cell at a known rate of flow, and the sulfur dioxide in the sample changes the electrical properties of the solution. A detectable electric current between the platinum electrodes results, which is proportional to the sulfur dioxide concentration in the continuously drawn sample of ambient air. The results are reported in parts per million. The detection limit for this method is 26 micrograms per cubic meter.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, tasteless gas that is very flammable. It is the most commonly occuring air pollutant, with total emissions exceeding all other pollutants combined.

Carbon monoxide is produced by both natural sources and technological sources. In nature, CO has been found to be produced from volcanos, natural gases from coal mines, electrical storms and lightning related forest fires. Small quantities are also formed during some seed germinations and aquatic plant growth. The largest quantities of carbon monoxide, however, are the result of fuel combustion in mobile sources utilizing the internal combustion engine.

Since carbon monoxide is a toxic gas, large concentrations can be fatal to humans and animals. Carbon monoxide, like oxygen, reacts with hemoproteins in the blood; an increase in carbon monoxide exposure will cause a decrease in oxygen in the blood. A lack of oxygen in the blood for extended periods of

time may cause damage to the brain, central nervous system, and cardiovascular system and may eventually cause death.

Monitoring for carbon monoxide is done on a continuous basis using instrumentation based on the ability of the carbon monoxide molecule to absorb infrared radiation of a specific wavelength. A beam of infrared radiation is split into two paths; one is passed through a cell containing a sample of air, the other is used as a reference. After the beam passes through the air sample, the difference in the radiation intensities of the two beams is measured, using a special detector that is sensitive to varying levels of this radiation. The output of this detector is an electronic signal that is proportional to the carbon monoxide in the air sample reported in milligrams per cubic meter. Minimum detectable concentration is equal to 0.6 micrograms per cubic meter.

Photochemical Oxidants (Ozone)

Ozone is one of the highly reactive oxidants that is produced in the atmosphere by the chemical combination of hydrocarbons, nitrogen oxide and sunlight. Ozone is not only a pollutant in itself, but, because it is almost entirely produced as a result of other pollutants (NO_2 and Hydrocarbons), it serves as an indicator of their presence. In addition, ozone is more reliably monitored than the pollutants that cause its formation.

Photochemical oxidants have adverse effects on property, vegetation, and human health. Ozone is reactive with rubber, cellulose in textile fabrics, and certain dyes, causing decay or chemical alteration. In vegetation, oxidants have been shown to cause injury to leafy vegetables and field crops by destroying plant cells. This effect increases growth alterations, reduces yields and changes the quality of plant products. Photochemical oxidants will also cause injury to humans by altering or impairing normal respiratory processes.

The continuous detector method used is chemiluminescence. In this method, the air sample is mixed with ethylene gas in a reaction chamber. If there is ozone in the sample, it will combine with the ethylene in a photochemical reaction. Light is emitted from the reaction at a rate proportional to the amount of ozone present. This light energy is measured in a photomultiplier tube which gives results indicative of levels of ozone in parts per million (ppm). The minimum detectable concentration is 0.001 ppm.

There is also a bubbler method for detecting all oxidants (ozone is a specific oxidant, others are chlorine and hydrogen peroxides). Air samples are bubbled through an absorbing solution of sodium hydroxide and potassium iodide which is mixed with sulfuric acid and phosphoric acid later in the laboratory to produce a yellow color proportional to the oxidant level. This color is also measured spectrophotometrically.

Nitrogen Oxides (Nitrogen Dioxide)

Nitrogen oxides are atmospheric pollutants that consist of nitric oxide, nitrogen dioxide, and other less significant oxides of nitrogen. The only nitrogen oxide present in the atmosphere in appreciable concentrations is nitrogen dioxide. Nitrogen dioxide is a reddish-orange-brown gas that has a pungent odor. It is very corrosive, highly oxidizing, and is irritating and toxic.

Nitrogen oxides are produced from fuel combustion. Fossil fuel burning stationary sources and fuel combustion from mobile sources are the two largest contributors. A small amount of nitrogen oxides are also produced naturally by bacterial action.

Textile dyes, natural and synthetic fibers, and metals have been shown to be affected by nitrogen oxides. Nitrogen dioxide has been shown to cause injury

to vegetation by destroying plant cells. This effect increases growth alterations, reduces yields, and changes the quality of the plant products. In humans, nitrogen oxides, like ozone, will cause injury by altering or impairing normal respiratory processes.

The method for monitoring nitrogen dioxide is a 24-hour bubbler method which is now only a tentative EPA reference method. It consists of an absorbing solution of sodium hydroxide-sodium arsenite which is later reacted with phosphoric acid, sulfanilamide and other compounds to form a dye which can be evaluated colorimetrically. The results are reported in micrograms per cubic meter, with the minimum detection capability of five micrograms per cubic meter.

Hydrocarbons

Hydrocarbons are organic compounds that consist of atoms of hydrogen and carbon. Many of these compounds enter into photochemical reactions and produce photochemical air pollutants.

Hydrocarbons originate primarily from incomplete fuel combustion (e.g. carburated gasoline engines), organic solvent loss (e.g., chemical manufacturing, rubber and plastic production, paint, varnish and lacquer usage, and drycleaning materials), and petroleum production, processing, storage, and transfer.

Since many hydrocarbons enter into the formation of photochemical air pollution, effects on materials, vegetation, and humans are similar to that of photochemical oxidants.

The Environmental Protection Agency has not established a reference method for monitoring hydrocarbons. However the method used in Iowa involves gas chromography with flame ionization detection. Since the principle hydrocarbon

component, methane, is inert in photochemical reaction, it is desirable to monitor it separately to obtain an accurate measurement of photochemically reactive hydrocarbons. A quantity of ambient air is passed through a separating column to separate the methane from the other hydrocarbons. This methane gas is measured by a flame ionization detector. A second quantity of ambient air is passed directly to the flame ionization detector to measure total hydrocarbons. Total non-methane hydrocarbons are then calculated by subtracting the measured methane value from the total hydrocarbon value.

Sulfates

Atmospheric sulfates are another category of sulfur oxides that have recently been investigated because of their increasing concentrations in the atmosphere.

Sulfates are found in the air in the form of aerosols and particulates. They are produced by the transformation of natural sulfide products, the conversion of sulfur dioxide, or the combustion of solid and liquid fossil fuels. Sulfates also have been linked to catalytic converter emissions.

Excessive concentrations of sulfates have adverse effects on property, vegetation, and human health similar to those caused by sulfur oxides (see page 4). In the aerosol forms sulfates are also known to significantly contribute to reductions in visibility.

The 24-hour sampling method is used to collect sulfates in a Hi-Volume sampler filter. After measurements are completed for suspended particulates, a three-fourth's inch thick strip of exposed filter is cut, placed in a flask of distilled water which is connected to a condenser. The extract obtained from this process is cooled and filtered. The extraction process

is repeated to obtain a designated volume of filtrate. This filtrate is analyzed using the turbidimetric method. First, a sample of the filtrate is used to obtain a background absorbance. Next, Sulfavor 4 powder is added and the absorbance is read again. The absorbance is used to find the amount of sulfate from a standardized calibration curve which plots micrograms of sulfate versus absorbance levels. Since the volume of air drawn through the Hi-Volume filter is already known, the final concentration, in micrograms per cubic meter, is easily obtained.

III. AIR MONITORING NETWORK

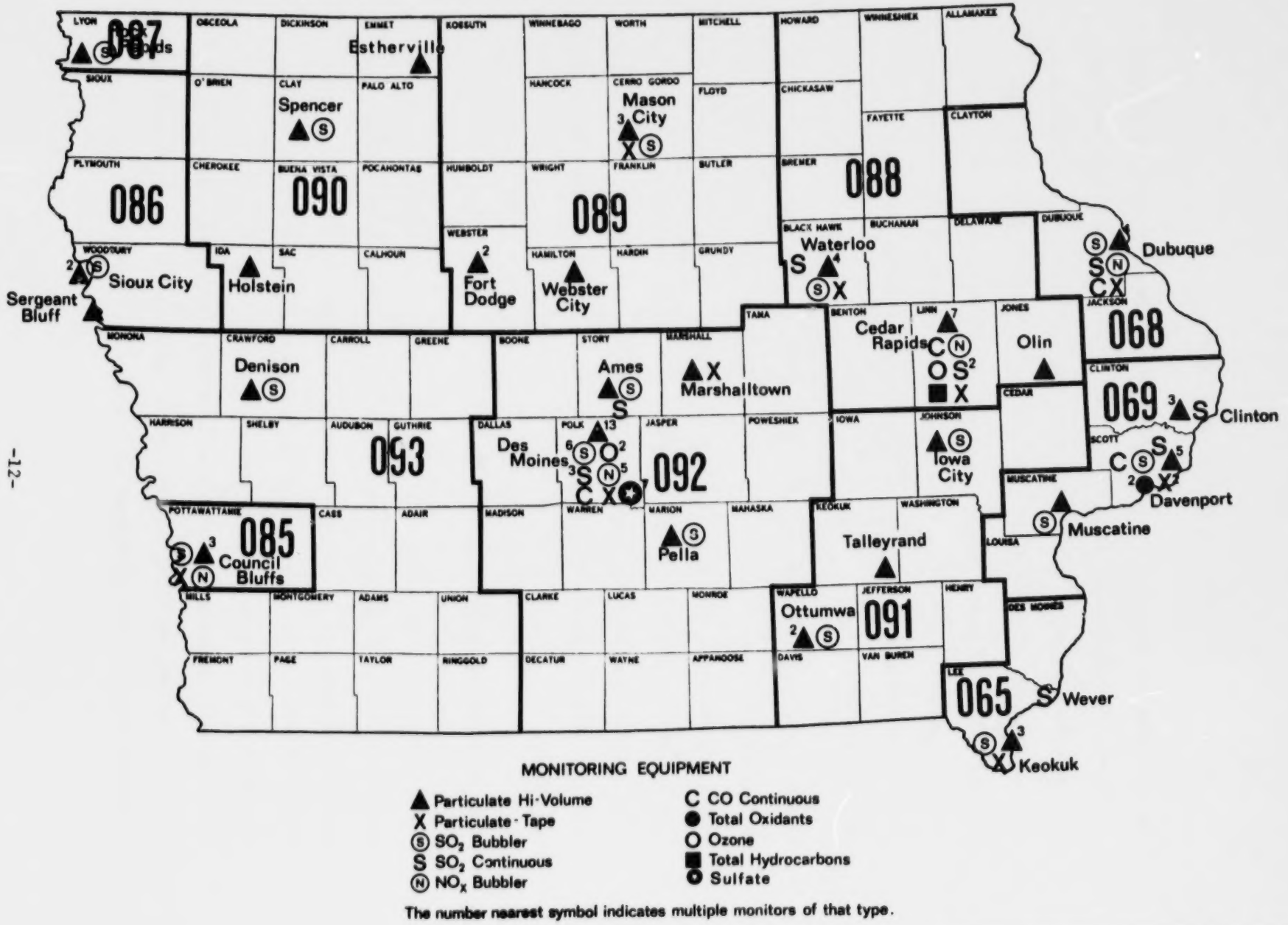
The 1976 Iowa Air Monitoring Network consisted of 125 monitors at 71 sites in 37 cities. The network has been thoroughly reviewed to ensure that sampling locations meet EPA guidelines. At some of the existing sites, the monitors were repositioned or the sampler inlets were modified to comply with federal recommendations. Fourteen new monitoring sites began operation in 1976 and three new sites are currently planned to begin operation in 1977. Continued review is expected in the future to improve the monitoring network and monitoring data.

Monitor operations are conducted by five agencies in Iowa: State Hygienic Laboratory (SHL), Des Moines-Polk County Health Department (DMPC), Linn County Health Department (LCHD), Quad Cities Area Regional Air Pollution Control Board (QCAP), and Environmental Protection Agency's National Air Surveillance Network (EPA). These agencies were responsible for monitor maintenance, data acquisition, and data reporting. Figure 1 is an illustration of the Iowa Air Monitoring Network.

State Hygienic Laboratory

The largest part of the State's air monitoring is conducted by the State Hygienic Laboratory. In 1976, SHL maintained a fixed monitoring network consisting of 39 Hi-Volume samplers, 14 sulfur dioxide gas bubblers, 8 continuous sulfur dioxide monitors, 1 nitrogen dioxide gas bubblers, 7 coefficient of haze tape samplers and 1 carbon monoxide monitor. During 1975 and 1976, the State Hygienic Laboratory expanded the fixed station network. Eleven new Hi-Volume samplers and three new continuous sulfur dioxide monitors were located throughout the State for additional monitoring data. Several of these were

Figure 1. Air monitoring stations operated during 1976.



installed during the first quarter of 1976. In addition, many monitors were relocated because of a study conducted in the summer of 1975 that indicated improper placement and location of some monitoring equipment. During 1975 and early in 1976, a total of 42 monitors were installed, moved, or adjusted in some way as a part of DEQ's quality assurance program for the air quality sampling network. In addition to the fixed stations, the SHL maintained a mobile laboratory capable of monitoring suspended particulates (both Hi-Volume and tape sampler), continuous sulfur dioxide, continuous nitrogen dioxide, continuous carbon monoxide, continuous non-methane hydrocarbons and wind speed and direction. This mobile unit makes it possible to survey all types of problem areas and emergency situations for which fixed station monitoring is not available.

Des Moines-Polk County Health Department

Des Moines-Polk County Health Department is one of the three local agencies conducting monitoring. In 1976, DMPC operated 12 Hi-Volume samplers, 5 sulfur dioxide gas bubblers, 5 nitrogen dioxide gas bubblers, 2 ozone monitors, and 2 carbon monoxide monitors. This monitoring equipment was located in nine cities throughout Polk County.

Linn County Health Department

Linn County's fixed monitoring network consisted of 6 Hi-Volume samplers, 2 continuous sulfur dioxide monitors, 1 nitrogen dioxide gas bubblers, 1 co-efficient of haze tape sampler, 1 carbon monoxide monitor, 1 ozone monitor and 1 non-methane hydrocarbon monitor. Except for a Hi-Volume sampler in Central City, all of the monitoring equipment listed above was located in Cedar Rapids.

Quad Cities Area Regional Air Pollution Control Board

In cooperation with the State Hygienic Laboratory, the Quad Cities air pollution agency operates 4 Hi-Volume samplers, 1 sulfur dioxide continuous monitor, 1 sulfur dioxide gas bubbler, 2 coefficient of haze tape samplers and 2 total oxidant monitors in the Davenport area. This monitoring equipment includes a mobile monitoring unit donated to the local agency by Iowa-Illinois Gas and Electric. This unit is equipped to monitor suspended particulates, sulfur dioxide, total oxidants, carbon monoxide, and wind speed, wind direction, and temperature. The Quad Cities agency is also responsible for reporting data to the Illinois Environmental Protection Agency.

National Air Surveillance Network

The U.S. Environmental Protection Agency's National Air Surveillance Network consisted of five sites in Iowa. All sites have a Hi-Volume sampler and two sites, Des Moines and Dubuque, also have a sulfur dioxide gas bubbler and nitrogen dioxide gas bubbler. All samples are analyzed by EPA and reported to the state agency.

IV. DATA SUMMARY

Data Interpretation

A compilation of air monitoring data through 1976 is listed by Air Quality Control Region (AQCR) in the following sections. Each section consists of a map of the AQCR showing cities where air quality monitoring is being done, a directory of monitoring data, and graphs illustrating trends in air quality. In the tables of monitoring data, years that have insufficient data to be used as an annual statistic representative of air quality for that year are designated by an asterisk (*).

Figure 1 may be used to locate cities and AQCR's in which monitoring equipment is located.

Monitoring Data by Air Quality Control Regions

		Pages
AQCR 065	Burlington - Keokuk Interstate	16-20
AQCR 068	Metropolitan Dubuque Interstate	21-25
AQCR 069	Metropolitan Quad Cities Interstate	26-32
AQCR 085	Metropolitan Omaha-Council Bluffs Interstate	33-36
AQCR 086	Metropolitan Sioux City Interstate	37-39
AQCR 087	Metropolitan Sioux Falls Interstate	40-42
AQCR 088	Northeast Iowa Intrastate	43-51
AQCR 089	Northcentral Iowa Intrastate	52-55
AQCR 090	Northwest Iowa Intrastate	56-58
AQCR 091	Southeast Iowa Intrastate	59-61
AQCR 092	Southcentral Iowa Intrastate	63-78
AQCR 093	Southwest Iowa Intrastate	79-81

AQCR 065

BURLINGTON – KEOKUK INTERSTATE

KEOKUK	WEVER
4 Particulate Hi-Volume	1 SO_2 Continuous
1 Particulate - Tape	
2 SO_2 Bubbler	

AQCR 065 BURLINGTON-KEOKUK INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Des Moines County				
Wever Pump House		SHL	SO_2 Cont.	Industrial
Lee County				
Keokuk Water Pollution Control Plant	1000 Mississippi Dr.	SHL	Hi-Vol SO_2 Bubbler Tape Sampler	Industrial
Keokuk Water Treatment Plant	415 Blondeau St.	SHL	Hi-Vol	Commercial
Keokuk High School	Washington & Middle Road	SHL	Hi-Vol	Residential
Keokuk Fire Station	13th & Johnson St.	SHL	Hi-Vol SO_2 Bubbler	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples > 24 Hr. Std. Secondary	No. of Samples > 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Lee County									
Keokuk Water Pollution Control Plant									
	1970*	7	327.0	262.0	2	2	174	159	1.56
	1971*	17	840.0	559.0	2	2	145	86	2.00
	1972	38	667.0	655.0	11	6	166	118	2.27
	1973	40	648.5	351.0	17	5	156	119	1.93
	1974	54	458.0	377.0	18	5	133	97	2.17
	1975	54	387.0	377.0	19	7	143	118	1.90
	1976†	54	906.0	510.0	33	11	206	171	1.86

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
>Represents greater than.
†High values due to construction on plant site during 1976.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≻ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Lee County									
Keokuk Water Treatment Plant									
	1971*	7	95.8	73.9	0	0	58	55	1.40
	1972	50	299.0	150.0	1	1	73	64	1.65
	1973	43	223.0	221.0	5	0	85	74	1.58
	1974	56	196.0	157.0	2	0	75	67	1.64
	1975	58	202.0	147.0	1	0	78	71	1.58
	1976*	6	132.0	124.0	0	0	76	64	1.94
Keokuk High School									
	1976*	32	229.0	144.0	1	0	70	64	1.48
Keokuk Fire Station									
	1976*	42	296.0	155.0	2	1	88	80	1.52

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Lee County					
Keokuk Water Pollution Control Plant	1973	4204	0.91	0.82	0.08
	1974	3856	0.82	0.74	0.09
	1975	2255	1.22	1.09	0.10
	1976	3494	1.44	1.13	0.10

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≻Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples >24 Hr. Std.	Arith. Mean
Lee County						
Keokuk Water Pollution Control Plant	1973*	35	103.0	67.0	0	10.0
	1974	55	1240.0	338.0	1	70.6
	1975	50	273.0	151.0	0	25.8
	1976*	5	417.8	51.1	1	101.3
Keokuk Fire Station	1976*	41	55.3	29.6	0	8.7

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 3 Hr.	2nd Max. 3 Hr.	No. of Samples >3 Hr. Std.	Max. 24. Hr.	2nd Max. 24 Hr.	No. of Samples >24 Hr. Std.	Arith. Mean
Des Moines County									
Wever Pump House	1973*	2473	379	347	0	159	37	0	7
	1974	7037	489	356	0	180	140	0	12
	1975	5567	166	52	0	35	33	0	7
	1976	8251	52	51	0	37	31	0	1

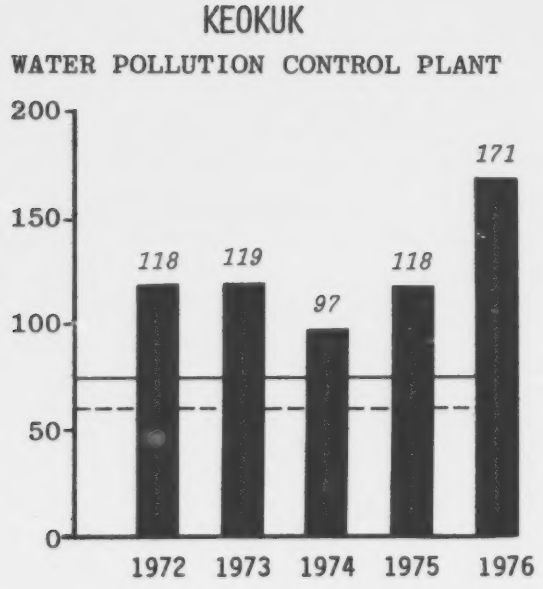
*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

>Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

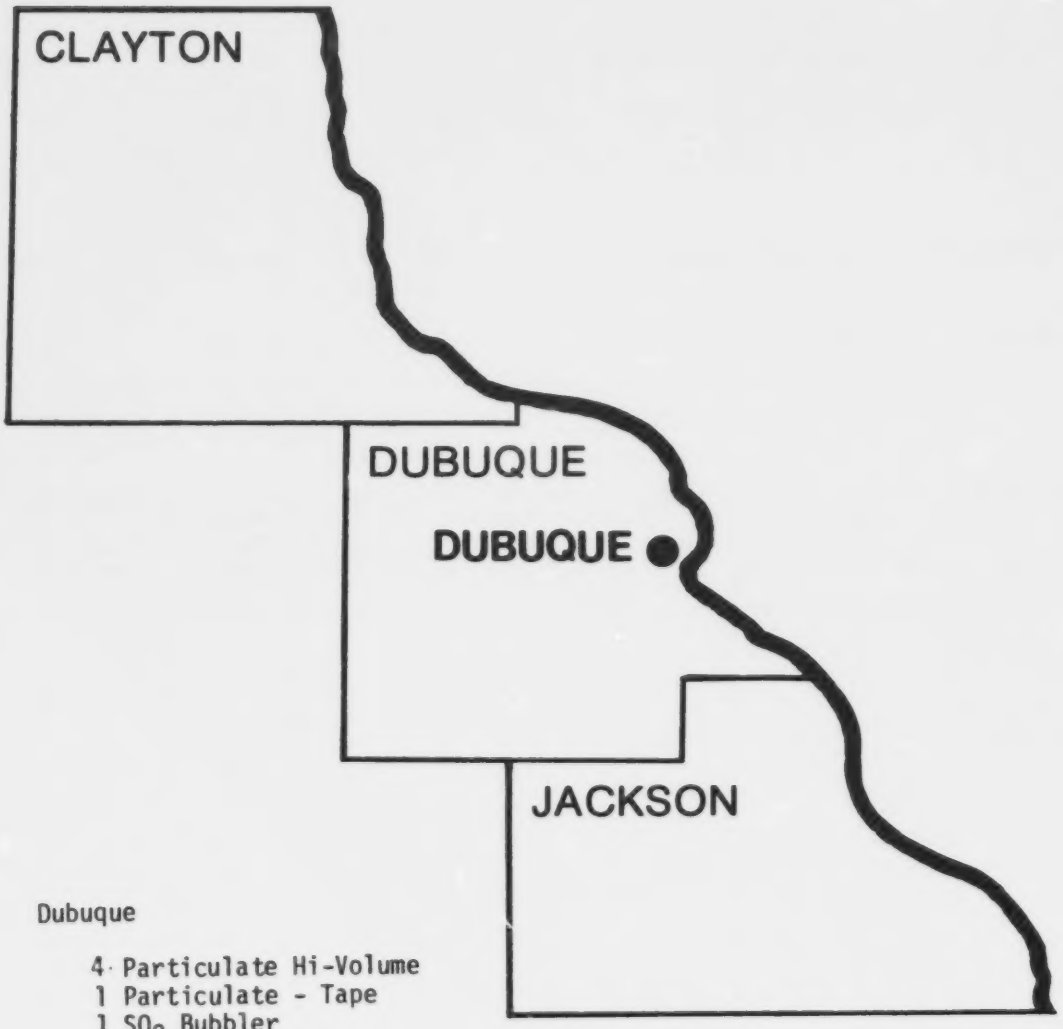
PRIMARY
STANDARD 75 ———

SECONDARY
STANDARD 60 ------



AQCR 068

METROPOLITAN DUBUQUE INTERSTATE



Dubuque

- 4 Particulate Hi-Volume
- 1 Particulate - Tape
- 1 SO_2 Bubbler
- 1 SO_2 Continuous
- 1 NO_x Bubbler
- 1 CO Continuous

AQCR 068 METROPOLITAN DUBUQUE INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Dubuque County				
Dubuque City Garage	925 Kerper	SHL	Tape Sampler	Industrial
Dubuque Fire Station #4	University & Atlantic	EPA	Hi-Vol	Residential
Dubuque Eagle Pt. Pump Station	Hawthorne & Rhomberg	SHL	Hi-Vol. SO_2 Cont.	Industrial
		EPA	Hi-Vol SO_2 Bubbler NO_2 Bubbler	
Dubuque Pixler Electric	11 Bluff Street	SHL	CO Cont.	Commercial
Dubuque Post Office	305 West Sixth Street	SHL	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≻ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Dubuque County									
Dubuque Fire Station #4	1964	24	161.0	-	-	0	74	67	1.63
	1967*	25	163.0	-	-	0	60	54	1.59
	1968*	15	222.0	-	-	0	61	46	2.27
	1969	23	268.0	-	1	1	79	70	1.63
	1970*	11	383.0	-	-	-	132	107	1.96
	1971*	3	139.0	-	0	0	93	89	2.17
	1972	24	231.0	174.0	3	0	76	64	1.76
	1973*	5	102.0	53.0	0	0	52	47	1.63
	1974	28	112.0	102.0	0	0	56	49	1.74
	1975	32	93.0	88.0	0	0	44	38	1.81
	1976	54	174.0	120.0	1	0	53	47	1.66

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≻Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std.		Arith Mean	Geo. Mean	SGD+
					Secondary	Primary			
Dubuque County									
Dubuque (EPA) Eagle Pt. Pump Station	1973*	4	39.0	36.0	0	0	31	30	1.32
	1974	28	134.0	132.0	0	0	53	44	1.82
	1975	33	126.0	119.0	0	0	46	39	1.76
	1976	53	246.0	196.0	2	0	61	52	1.69
Dubuque Eagle Pt. Pump Station	1976*	24	180.0	151.0	2	0	67	59	1.65
Dubuque Post Office	1976*	39	245.0	133.0	1	0	78	67	1.66

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith Mean
Dubuque County					
Dubuque City Garage	1973*	442	1.27	1.09	0.15
	1974	2316	0.91	0.82	0.09
	1975*	1083	1.18	1.00	0.10
	1976	1394	1.04	1.00	0.17

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≳Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES (Micrograms Per Cubic Meter)						
Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std.	Arith. Mean
Dubuque County						
Dubuque (EPA) Eagle Pt. Pump Station	1974*	26	121.0	36.0	0	16.1
	1975	32	112.0	73.0	0	24.7
	1976	51	56.0	56.0	0	16.0

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES (Micrograms Per Cubic Meter)									
Site Location	Year	No. of Samples	Max. 3 Hr.	2nd Max. 3 Hr.	No. of Samples ≥3 Hr. Std.	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std.	Arith. Mean
Dubuque County									
Dubuque Eagle Pt. Pump Station	1973*	753	318	233	0	102	91	0	32
	1974	4813	624	523	0	354	350	0	53
	1975	4140	484	420	0	230	149	0	9
	1976	7139	294	266	0	168	52	0	4

NITROGEN DIOXIDE - 24 HOUR SAMPLES (Micrograms Per Cubic Meter)						
Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	Violation of Standard	Arith. Mean
Dubuque County						
Dubuque (EPA) Eagle Pt. Pump Station	1974*	26	55.0	51.0	No	27.4
	1975	34	62.0	43.0	No	24.3
	1976	54	80.0	74.0	No	33.1

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

≥Represents greater than.

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES (Parts Per Million)									
Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ≥1 Hr. Std.	Max. 8 Hr.	2nd Max. 8 Hr.	No. of Samples ≥8 Hr. Std.	Arith. Mean
Dubuque County									
Dubuque Pixler Electric	1975*	4165	13.2	12.7	0	10.6	6.9	1	1.9
	1976*	4002	10.7	10.4	0	9.0	8.7	0	2.5

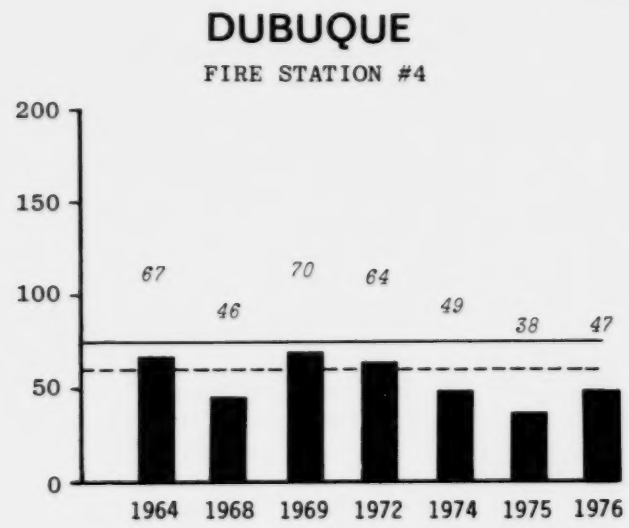
*Do not use as annual statistics representative of air quality for that year becuase four valid quarters are not available.

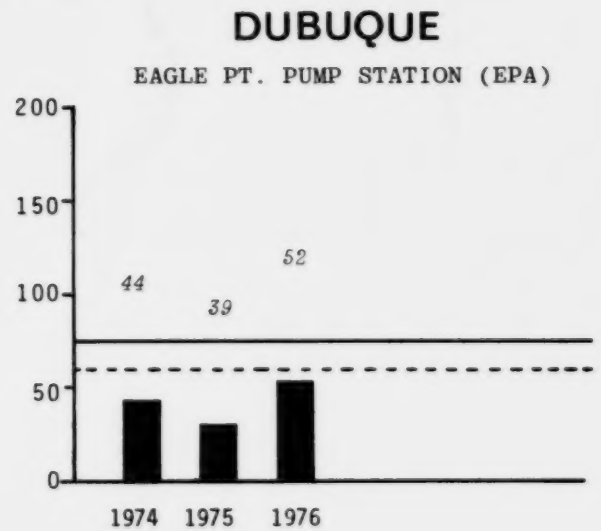
≥Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY
STANDARD 75 ———

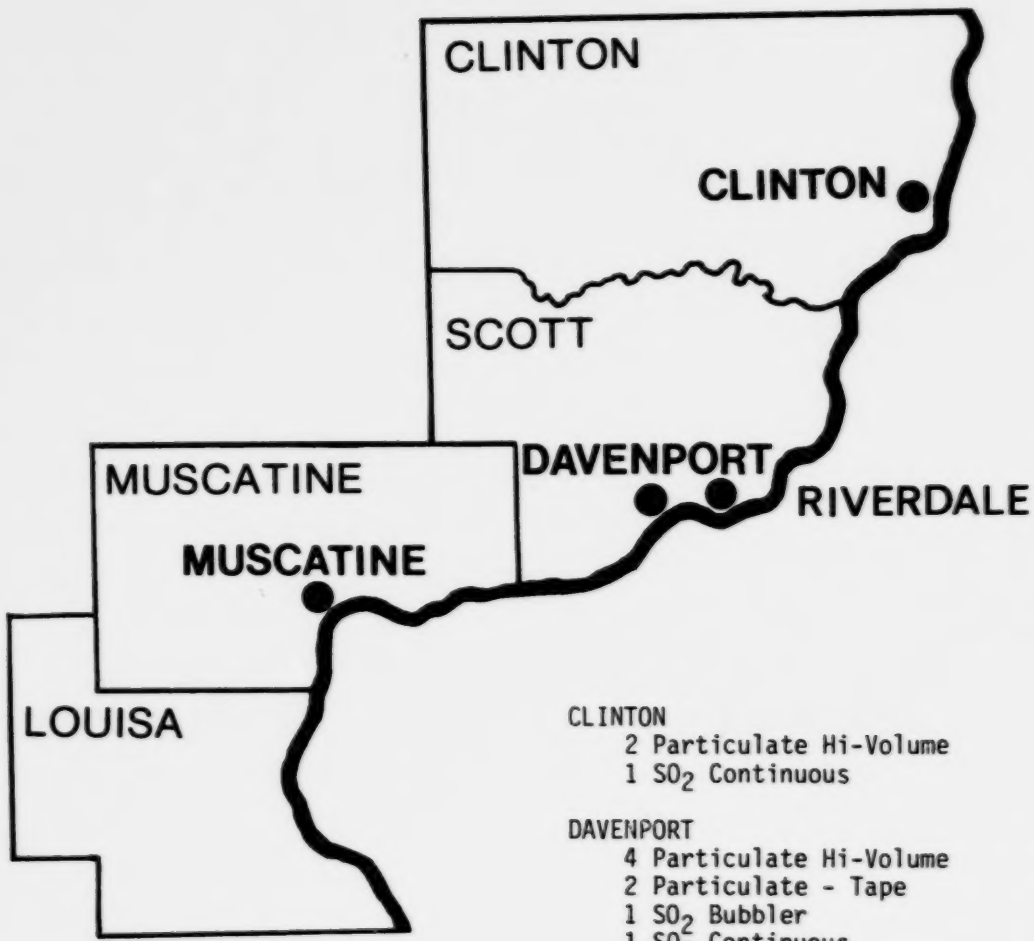
SECONDARY
STANDARD 60 ------





AQCR 069

METROPOLITAN QUAD CITIES INTERSTATE



CLINTON
- 2 Particulate Hi-Volume
- 1 SO_2 Continuous

DAVENPORT
- 4 Particulate Hi-Volume
- 2 Particulate - Tape
- 1 SO_2 Bubbler
- 1 SO_2 Continuous
- 2 Total Oxidants
- 1 CO Continuous

MUSCATINE
- 1 Particulate Hi-Volume
- 1 SO_2 Bubbler

RIVERDALE
- 1 Particulate Hi-Volume

AQCR 069 METROPOLITAN QUAD CITIES INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Clinton County				
Clinton Sewage Treatment Plant	1901 Beaver Channel Parkway	SHL	Hi-Vol	Industrial
Clinton Central Fire	N. 4th St. & 3rd Ave. S.	SHL	SO_2 Cont.	Commercial
Clinton Lyons Junior High School	North 4th Street & 28th Avenue North	SHL	Hi-Vol	Residential
Muscatine County				
Muscatine City Hall	E. 3rd & Sycamore	SHL	Hi-Vol SO_2 Bubbler	Commercial
Scott County				
Riverdale Pleasant Valley School	Belmont Road	QCARAPC	Hi-Vol	Residential
Davenport Central Fire Station	331 Scott	EPA	Hi-Vol	Commercial
Davenport Ia.-Ill. Gas & Electric	Third & Pershing	SHL[a]	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Davenport Monroe School	1946 West 4th	QCARAPC	Hi-Vol	Industrial
Davenport Ia. Highway Patrol Station	3200 Block Elmore	QCARAPC SHL[a]	Hi-Vol Tape Sampler SO_2 Cont. Total Oxidants CO Continuous	Commercial
Davenport St. Ambrose College	518 West Locust	QCARAPC	Total Oxidants	Residential

[a]Monitoring equipment maintained by Quad Cities Area Regional Air Pollution Control Board (QCARAPC).

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std. Secondary	No. of Samples ≥24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Clinton County									
Clinton									
Sewage Treatment	1975	50	265.0	206.0	5	1	80	67	1.81
Plant	1976	60	441.0	288.0	11	5	111	91	1.89
Clinton									
Central Fire	1975*	2	47.4	32.2	0	0	40	37	1.31
Station	1976*	33	328.0	157.0	2	1	73	60	1.84
Clinton									
Lyons Junior High School	1976*	39	230.0	97.2	1	0	59	51	1.74
Muscatine County									
Muscatine									
City Hall	1975*	2	48.4	36.0	0	0	42	42	1.23
	1976	58	279.0	142.0	1	1	84	76	1.57
Scott County									
Riverdale									
Pleasant Valley	1974	48	148.0	147.0	0	0	63	54	1.75
School	1975	60	150.0	106.0	0	0	54	48	1.61
	1976	56	277.0	176.0	2	1	72	63	1.69
Davenport									
Central Fire	1958	20	276.0	-	-	1	133	125	1.43
Station	1961	26	237.0	-	-	0	111	95	2.00
	1963	25	270.0	-	-	1	114	102	2.00
	1964	23	313.0	-	-	-	166	150	1.60
	1966	25	238.0	-	-	0	121	109	2.00
	1968	24	291.0	-	-	-	153	139	1.56
	1969	26	319.0	288.0	13	4	170	152	2.00
	1970	25	302.0	-	14	3	165	148	1.65
	1971*	23	1128.0	865.0	-	5	239	169	2.22
	1972	26	340.0	326.0	12	3	147	127	1.77
	1973*	5	156.0	81.0	1	0	74	64	1.77
	1974	28	228.0	193.0	7	0	114	101	1.78
	1975	35	207.0	198.0	3	0	94	84	1.64
	1976	53	264.0	173.0	2	1	86	77	1.57

≥ Represents greater than.

* Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

\+ Standard Geometric Deviation

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std. Secondary	No. of Samples ≥ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Scott County									
Davenport Ia.-Ill. Gas & Electric	1970	27	229.0	183.0	6	0	119	112	1.42
	1971	32	350.0	270.0	7	2	117	101	2.00
	1972	55	230.0	216.0	7	0	109	101	1.47
	1973	56	228.0	220.5	16	0	119	107	1.72
	1974	44	194.0	194.0	6	0	94	84	1.63
	1975	54	225.0	182.0	3	0	91	85	1.49
	1976	60	269.0	265.0	8	2	104	93	1.60
Davenport Monroe School	1974	58	211.0	201.0	8	0	95	78	1.78
	1975	59	151.0	136.0	0	0	67	61	1.59
	1976	61	249.0	160.0	2	0	77	68	1.67
Davenport Ia. Highway Patrol Station	1974*	47	184.0	156.0	3	0	68	61	1.61
	1975	56	166.0	166.0	3	0	66	58	1.61
	1976	59	1040.0	934.0	11	6	139	95	2.19

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Scott County					
Davenport Ia.-Ill. Gas & Electric	1973*	1944	0.91	0.82	0.16
	1974	3022	1.18	1.18	0.13
	1975	3422	2.70	1.30	0.19
	1976	4165	1.90	1.60	0.28
Davenport Ia. Highway Patrol Station	1974*	1970	1.90	1.70	0.27
	1975	4343	1.30	1.30	0.23
	1976	4139	1.80	1.60	0.22

* Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

\+ Standard Geometric Deviation

≥ Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std.	Arith. Mean
Muscatine County						
Muscatine City Hall	1975*	1	12.5	-	0	12.5
	1976	60	152.0	144.0	0	19.8
Scott County						
Davenport Ia.-Ill. Gas & Electric	1973	46	31.0	0.0	0	0.7
	1974	52	36.7	15.8	0	6.9
	1975	56	48.2	41.1	0	8.9
	1976	59	81.2	54.3	0	8.7

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 3 Hr.	2nd Max. 3 Hr.	No. of Samples ≥3 Hr. Std.	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std.	Arith. Mean
Clinton County									
Clinton Central Fire Station	1975*	368	1240	660	0	237	22	0	10
	1976	7763	1241	596	0	238	138	0	6
Scott County									
Davenport Ia. Highway Patrol Station	1974*	2423	260	183	0	149	125	0	30
	1975	5783	293	267	0	183	175	0	53
	1976	7842	379	345	0	223	223	0	63

* Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

≥ Represents greater than.

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ↘ 1 Hr. Std.	Max. 8 Hr.	2nd Max. 8 Hr.	No. of Samples ↘ 8 Hr. Std.	Arith. Mean
Scott County									
Davenport Ia. Highway Patrol Station	1976	7820	11.0	11.0	0	9.2	9.0	1	1.8

TOTAL OXIDANTS - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ↘ 1 Hr. Std.	Arith. Mean
Scott County						
Davenport Ia. Highway Patrol Station	1974*	3866	140	140	0	35
	1975	8491	202	190	20	50
	1976	8466	198	196	26	54
Davenport St. Ambrose College	1976	5980	212	208	3	58

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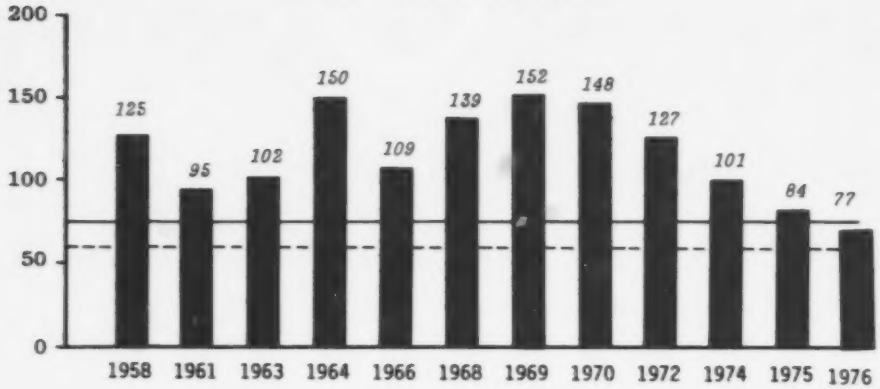
↘ Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ——— SECONDARY STANDARD 60 ------

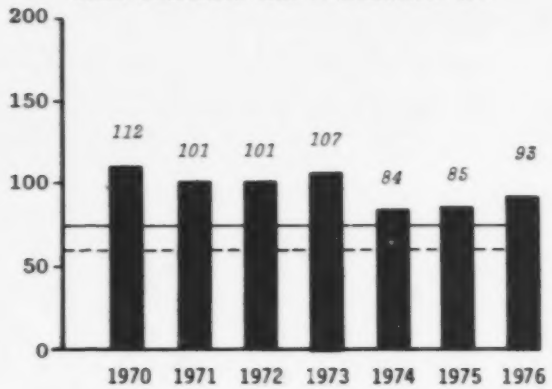
DAVENPORT

CENTRAL FIRE STATION (EPA)



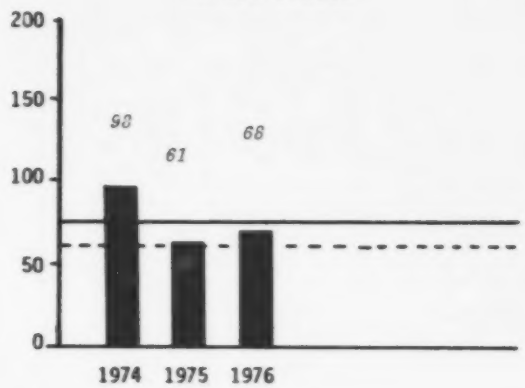
DAVENPORT

IOWA-ILLINOIS GAS & ELECTRIC CO.



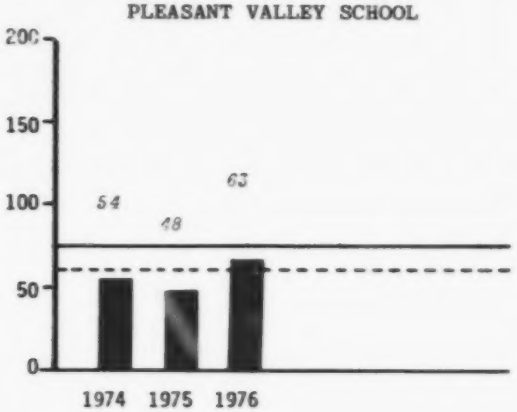
DAVENPORT

MONROE SCHOOL



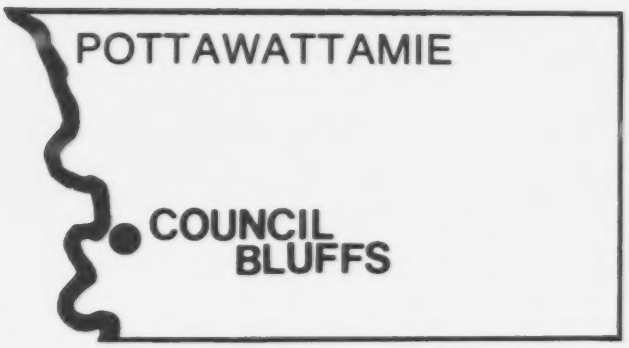
BETTENDORF

PLEASANT VALLEY SCHOOL



AQCR 085

METROPOLITAN
OMAHA — COUNCIL BLUFFS INTERSTATE



COUNCIL BLUFFS

- 3 Particulate Hi-Volume
- 1 Particulate - Tape
- 1 SO_2 Bubbler
- 1 NO_x Bubbler

AQCR 085 METROPOLITAN OMAHA-COUNCIL BLUFFS INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Pottawattamie County				
Council Bluffs City Hall	209 Pearl St.	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Council Bluffs Dodge Park Lift Station	Dodge Park	SHL	Hi-Vol NO_2 Bubbler	Industrial
Council Bluffs Water Works Building	2000 N. 25th St.	SHL	Hi-Vol	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std. Secondary	No. of Samples ≥24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Pottawattamie County									
Council Bluffs City Hall	1970*	17	233.0	190.0	4	0	122	99	1.48
	1971*	18	205.0	136.0	1	0	101	96	1.52
	1972*	21	217.0	176.0	6	0	116	94	2.39
	1973*	42	243.0	218.9	9	0	114	103	1.66
	1974	51	293.0	293.0	15	3	133	121	1.56
	1975	33	337.0	282.0	10	3	132	115	1.72
	1976	45	264.0	218.0	6	1	114	106	1.51
Council Bluffs Dodge Park Lift Station	1973*	31	188.0	178.0	2	0	77	65	1.85
	1974	53	744.0	587.0	12	4	129	99	1.92
	1975	35	263.0	211.0	7	1	109	95	1.75
	1976*	30	522.0	508.0	14	5	182	150	1.94
Council Bluffs Water Works Building	1976	48	429.0	283.0	6	3	105	89	1.74

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≥Represents greater than.

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Pottawattamie County					
Council Bluffs City Hall	1973*	1953	1.02	1.00	0.20
	1974	3229	0.78	0.74	0.12
	1975*	665	0.32	0.28	0.07
	1976*	1716	0.40	0.24	0.06

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳24 Hr. Std.	Arith. Mean
Pottawattamie County						
Council Bluffs City Hall	1973*	35	34.7	29.9	0	1.8
	1974	55	46.2	15.5	0	5.0
	1975	42	41.1	28.7	0	9.4
	1976*	41	39.7	36.7	0	10.6

NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	Violation of Standard	Arith. Mean
Pottawattamie County						
Council Bluffs Dodge Park Lift Station	1973*	25	50.0	45.9	No	24.8
	1974	46	85.7	63.8	No	26.2
	1975	31	42.3	30.9	No	10.6
	1976*	29	104.0	75.2	No	32.9

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
≳Represents greater than.

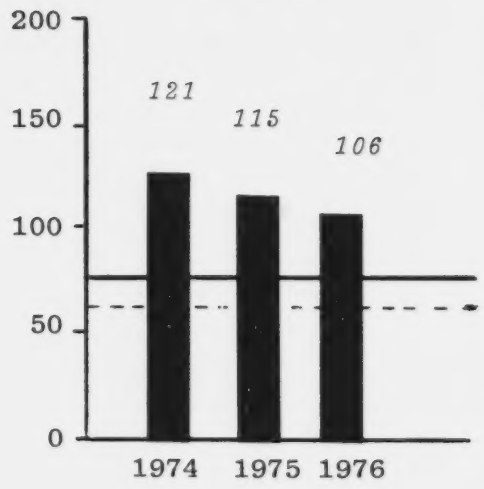
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES

MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ———— SECONDARY STANDARD 60 -----

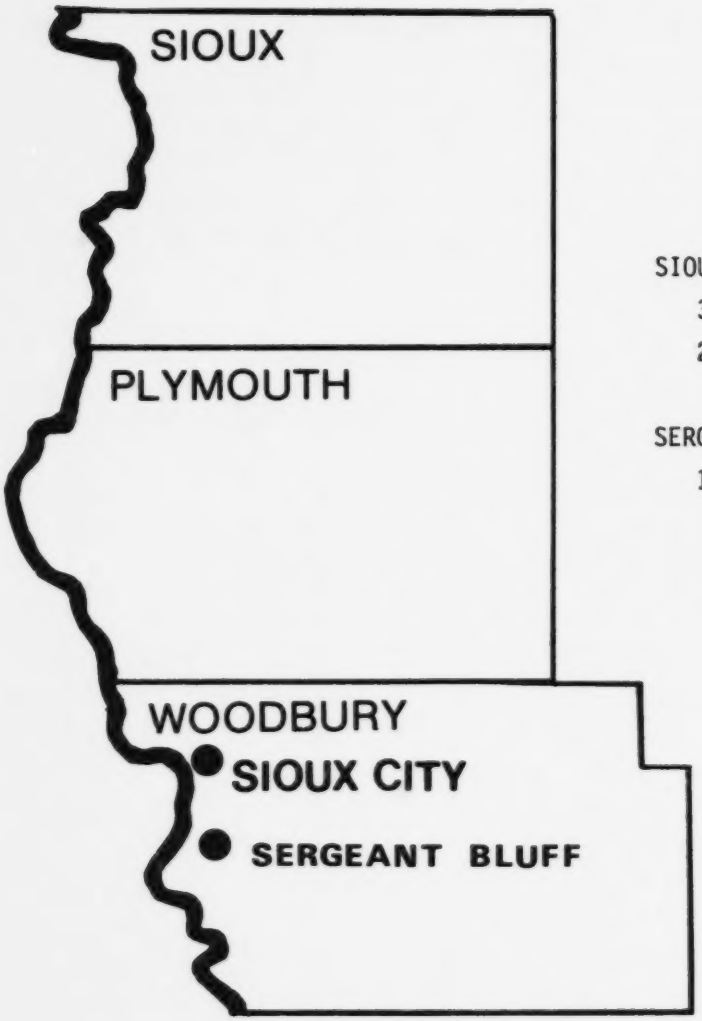
COUNCIL BLUFFS

CITY HALL



AQCR 086

METROPOLITAN SIOUX CITY INTERSTATE



SIOUX CITY

3 Particulate Hi-Volume

2 SO_2 Bubbler

SERGEANT BLUFF

1 Particulate Hi-Volume

AQCR 086 METROPOLITAN SIOUX CITY INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Woodbury County				
Sioux City City Hall	405 - 6th St.	SHL	Hi-Vol SO_2 Bubbler	Commercial
Sioux City Fire Station #9	27th & Chambers	SHL	Hi-Vol	Residential
Sioux City Federal Building	320 - 6th St.	SHL	Hi-Vol SO_2 Bubbler	Commercial
Sergeant Bluff Army Guard Armory	Airport	SHL	Hi-Vol	Industrial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Woodbury County									
Sioux City City Hall	1970*	19	131.0	110.0	0	0	76	71	1.44
	1971*	31	168.0	139.0	1	0	79	73	1.00
	1972	50	128.0	120.0	0	0	66	59	1.70
	1973	57	218.0	189.1	5	0	77	66	1.73
	1974	61	151.0	123.0	1	0	58	52	1.61
	1975	53	160.0	135.0	1	0	59	50	1.79
	1976*	37	190.0	142.0	1	0	72	62	1.77
Sioux City Federal Building	1976*	23	177.0	99.6	1	0	66	62	1.43
Sioux City Fire Station #9	1976*	49	242.0	234.0	4	0	90	80	1.65
Sergeant Bluff Army Guard Armory	1976*	49	236.0	210.0	2	0	74	64	1.79

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≳Represents greater than.

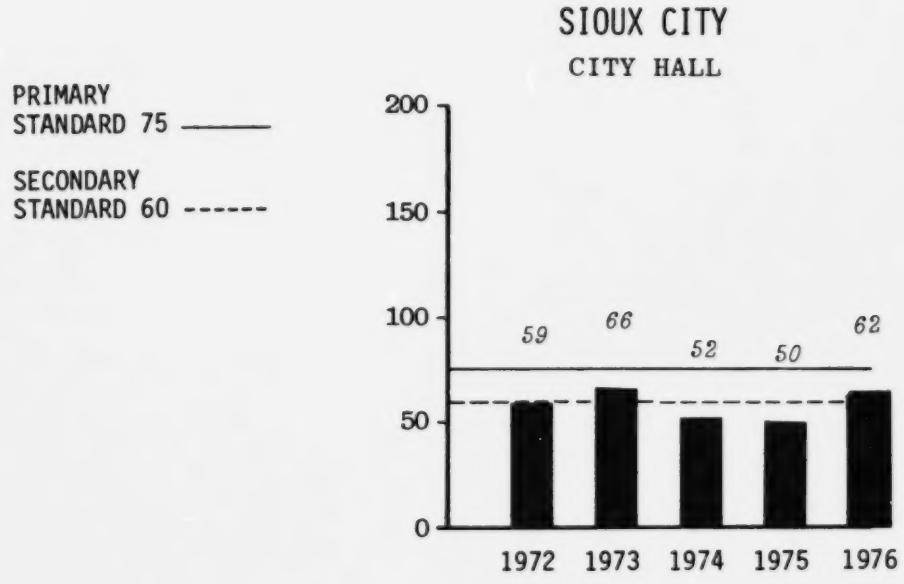
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ↘ 24 Hr. Std.	Arith. Mean
Woodbury County						
Sioux City City Hall	1973	40	0	0	0	0.0
	1974	59	21.8	12.5	0	4.1
	1975	55	12.5	12.5	0	4.8
	1976*	36	12.5	12.5	0	6.9
Sioux City Federal Building	1976*	22	12.5	12.5	0	6.3

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

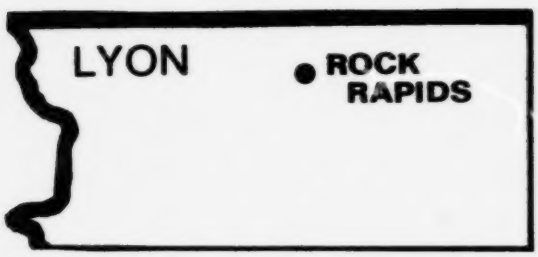
↘Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER



AQCR 087

METROPOLITAN SIOUX FALLS INTERSTATE



ROCK RAPIDS

1 Particulate Hi-Volume

1 SO_2 Bubbler

AQCR 087 METROPOLITAN SIOUX FALLS INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Lyon County				
Rock Rapids Municipal Utilities Bldg.	311 S. 3rd	SHL	Hi-Vol SO_2 Bubbler	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

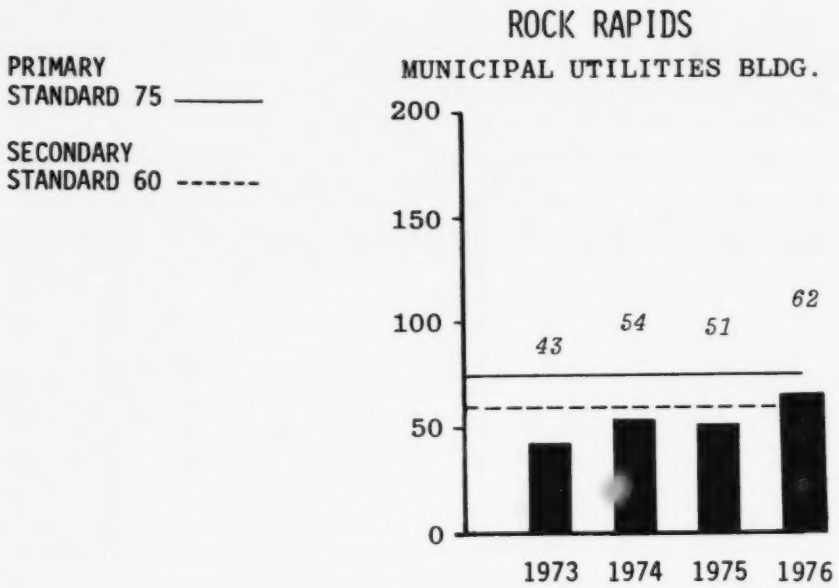
Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std. Secondary	Primary	Arith. Mean	Geo. Mean	SGD+
Lyon County									
Rock Rapids Municipal Utilities Building	1973	45	443.4	188.1	3	1	59	43	2.15
	1974	52	185.0	153.0	2	0	68	54	2.13
	1975	48	155.0	154.0	2	0	58	51	1.63
	1976	58	323.0	156.0	2	1	74	62	1.83

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	No. of Samples ≳ 24 Hr. Std.	Arith. Mean
Lyon County						
Rock Rapids Municipal Utilities Building	1973*	37	34.0	0.0	0	0.9
	1974	60	43.7	15.4	0	4.9
	1975	55	12.5	12.5	0	5.0
	1976	56	12.5	12.5	0	4.9

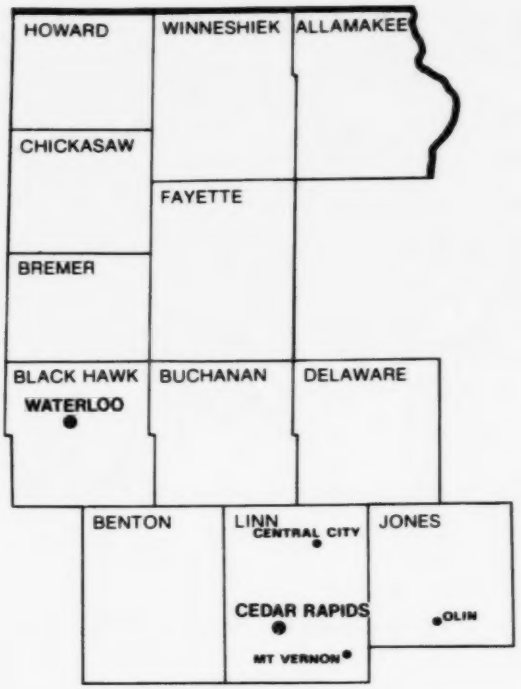
*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≳Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER



AQCR 088

NORTHEAST IOWA INTRASTATE



WATERLOO

- 5 Particulate Hi-Volume
- 1 Particulate - Tape
- 1 SO_2 Bubbler
- 1 SO_2 Continuous

OLIN

- 1 Particulate Hi-Volume

CENTRAL CITY

- 1 Particulate Hi-Volume

CEDAR RAPIDS

- 6 Particulate Hi-Volume
- 1 Particulate - Tape
- 1 NO_x Bubbler
- 2 SO_2 Continuous
- 1 CO Continuous
- 1 Ozone
- 1 Total Hydrocarbons

MT. VERNON

- 1 Particulate Hi-Volume

AQCR 088 NORTHEAST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Black Hawk County				
Waterloo Water Plant	3rd and Water	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Waterloo County Courthouse	316 E. 5th	EPA	Hi-Vol	Commercial
Waterloo St. Mary's Convent	129 East Parker	SHL	Hi-Vol SO_2 Continuous	Residential
Waterloo Fire Station #2	Byron & Randolph Sts.	SHL	Hi-Vol	Residential
Waterloo Northwestern Bell	East Second & Sycamore	SHL	Hi-Vol	Commercial
Jones County				
Olin Fire Station		SHL	Hi-Vol	Residential
Linn County				
Cedar Rapids Noelridge Park	4426 Council St. NE	LCHD	Hi-Vol NO_2 Bubbler	Residential
Cedar Rapids City Garages	445 - First St. SW	LCHD	Hi-Vol Tape Sampler SO_2 - Continuous	Industrial
		EPA	Hi-Vol	
Cedar Rapids Jane Boyd Community Center	14th Ave. & 10th St. SE	LCHD	Hi-Vol	Industrial
Cedar Rapids Linn County Health Department	751 Center Point Rd. NE	LCHD	Hi-Vol SO_2 - Continuous CO - Continuous Ozone THC - CH_4	Industrial
Cedar Rapids Grant Wood Building	4401 Sixth St. SW		Hi-Vol	Commercial

Site Location	Address	Agency	Equipment	Environment
Linn County				
Central City Fire Station	80 Fourth Street	LCHD	Hi-Vol	Residential
Mt. Vernon City Hall	213 1st St. W	LCHD	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Blackhawk County									
Waterloo Water Plant	1970*	23	161.0	158.0	2	0	100	92	1.52
	1971	33	238.0	221.0	4	0	98	86	1.67
	1972*	46	354.0	278.0	12	3	126	107	1.79
	1973	46	421.5	191.0	6	1	85	76	1.59
	1974	58	174.0	166.0	3	0	85	76	1.67
	1975	58	232.0	188.0	3	0	88	80	1.54
	1976*	5	147.0	124.0	0	0	99	95	1.41
Waterloo 316 E. 5th	1972*	19	249.0	156.0	2	0	114	107	1.40
	1973*	5	99.0	56.0	0	0	57	53	1.42
	1974	29	342.0	130.0	1	1	77	63	1.74
	1975	34	222.0	137.0	1	0	84	75	1.63
	1976	51	230.0	206.0	2	0	91	83	1.55
Waterloo Fire Station #2	1976*	35	257.0	108.0	1	0	75	69	1.47
Waterloo St. Mary's Convent	1976*	32	271.0	189.0	2	1	91	82	1.56
Waterloo Northwestern Bell	1976*	36	299.0	175.0	3	1	93	84	1.52

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≳ Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Jones County									
Olin Fire Station	1970*	5	132.0	106.0	0	0	90	88	1.50
	1971*	8	171.0	133.0	1	0	108	100	2.00
	1972*	25	181.0	179.0	5	0	106	92	1.84
	1973	53	229.0	188.0	4	0	88	79	1.64
	1974	60	220.0	196.0	2	0	74	64	1.79
	1975	54	226.0	172.0	5	0	83	74	1.63
	1976	58	191.0	190.0	5	0	93	82	1.68
Linn County									
Cedar Rapids Noelridge Park	1972*	35	160.0	146.0	1	0	69	60	1.74
	1973	49	228.5	162.3	2	0	78	70	1.58
	1974	55	193.3	149.1	1	0	67	63	1.63
	1975	58	173.0	163.5	3	0	71	62	1.73
	1976	55	400.7	395.7	2	2	84	70	1.75
Cedar Rapids City Garage	1972*	38	311.0	230.0	13	1	128	118	1.52
	1973	60	520.5	403.9	17	6	135	111	1.82
	1974	59	379.5	333.6	17	4	133	115	1.75
	1975	55	365.0	219.7	8	1	114	104	1.56
	1976	58	353.8	289.5	13	3	116	98	1.81
Cear Rapids Jane Boyd Comm. Center	1972*	30	256.0	226.0	13	0	130	115	1.67
	1973	49	274.3	263.4	15	2	132	123	1.47
	1974	60	269.3	252.2	16	1	111	104	1.65
	1975	55	211.9	208.0	13	0	112	101	1.62
	1976	60	449.7	311.1	12	2	119	106	1.61
Cedar Rapids Grantwood Bldg.	1976*	24	333.7	173.3	2	1	105	94	1.59
Cedar Rapids Linn County Health Dept.	1973	32	446.1	344.5	14	4	170	152	1.60
	1974*	15	248.7	175.7	4	0	130	123	1.42
	1975	45	314.8	305.0	14	3	139	126	1.54
	1976	59	269.6	209.5	11	1	108	99	1.56

*Do not use as annual statistics respresentative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≥ Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Linn County									
Cedar Rapids City Garages (EPA)	1970	23	238.0	-	-	0	117	111	1.45
	1971*	22	154.0	-	-	0	103	100	1.34
	1972	30	253.0	203.0	5	0	110	102	1.48
	1973*	4	102.0	60.0	0	0	64	59	1.51
	1974	23	278.0	232.0	4	1	101	85	1.80
	1975	33	162.0	161.0	2	0	93	87	1.45
	1976	54	337.0	271.0	9	3	99	81	1.89
Central City Fire Station	1973*	10	160.7	118.7	1	0	96	91	1.38
	1974*	13	236.0	149.5	1	0	80	58	2.35
	1975*	15	313.1	139.2	1	1	94	77	1.75
	1976*	13	176.1	164.5	3	0	108	100	1.51
Mt. Vernon City Hall	1973*	10	96.3	81.7	0	0	68	67	1.24
	1974*	13	162.9	129.5	1	0	65	53	1.94
	1975*	16	139.0	126.7	0	0	74	66	1.50
	1976*	3	105.1	97.3	0	0	79	71	1.86

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Blackhawk County					
Waterloo Water Plant	1973*	730	1.00	0.74	0.14
	1974	3249	1.18	1.09	0.11
	1975	3360	0.87	0.74	0.11
	1976*	1478	1.04	0.65	0.09
Linn County					
Cedar Rapids City Garages	1973	2748	2.17	2.06	0.24
	1974	4003	3.79	2.22	0.22
	1975	4099	4.12	4.04	0.28
	1976	3883	4.95	3.12	0.29

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≥ Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Blackhawk County						
Waterloo Water Plant	1973*	40	79.3	38.2	0	4.9
	1974	59	93.8	92.5	0	15.3
	1975	59	31.0	27.1	0	5.5
	1976*	39	12.5	12.5	0	5.1

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 3 Hr.	2nd Max. 3 Hr.	No. of Samples ≥ 3 Hr. Std.	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Blackhawk County									
Waterloo St. Mary's Convent	1976	4409	301	289	0	57	41	0	3
Linn County									
Cedar Rapids City Garages	1974	8318	572	469	0	232	214	0	54
	1975	8431	657	603	0	230	222	0	46
	1976	8511	647	631	0	390	332	1	59
Cedar Rapids Linn County Health Dept.	1973*	3877	-	-	0	288	259	0	42
	1975*	7207	467	357	0	183	173	0	42
	1976	8005	478	469	0	236	233	0	41

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

≥ Represents greater than.

NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	Violation of Standard	Arith. Mean
Linn County						
Cedar Rapids Noelridge Park	1974*	8	31.7	29.3	No	19.9
	1975*	15	49.0	33.8	No	22.7
	1976	53	63.9	53.3	No	26.9

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	No. of Samples	Max 1 Hr.	2nd Max. 1 Hr.	No. of Samples ≥ 1 Hr. Std.	Max. 8 Hr.	2nd Max. 8 Hr.	No. of Samples ≥ 8 Hr. St.	Arith. Mean
Linn County									
Cedar Rapids Linn County Health Dept.	1973*	2252	10.0	10.0	0	9.1	6.7	1	2.30
	1974*	1555	20.0	16.0	0	9.0	8.6	0	2.23
	1975	7260	18.0	17.0	0	10.7	9.6	14	3.56
	1976	8101	20.9	17.5	0	10.8	9.6	3	2.25

OZONE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ≥ 1 Hr. Std.	Arith. Mean
Linn County						
Cedar Rapids Linn County Health Dept.	1975*	6297	160	160	0	40
	1976	8450	270	210	77	50

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

≥ Represents greater than.

TOTAL HYDROCARBONS - 1 HOUR CONTINUOUS SAMPLES (Micrograms Per Cubic Meter)						
Site Location	Year	No. of Samples	Max. 3 Hr. (6-9 a.m.)	2nd Max. 3 Hr. (6-9 a.m.)	No. of Samples ≳ 3 Hr. Std.	Arith. Mean
Linn County						
Cedar Rapids Linn County Health Dept.	1975*	4260	980	880	86	164
	1976	8365	740	713	120	118

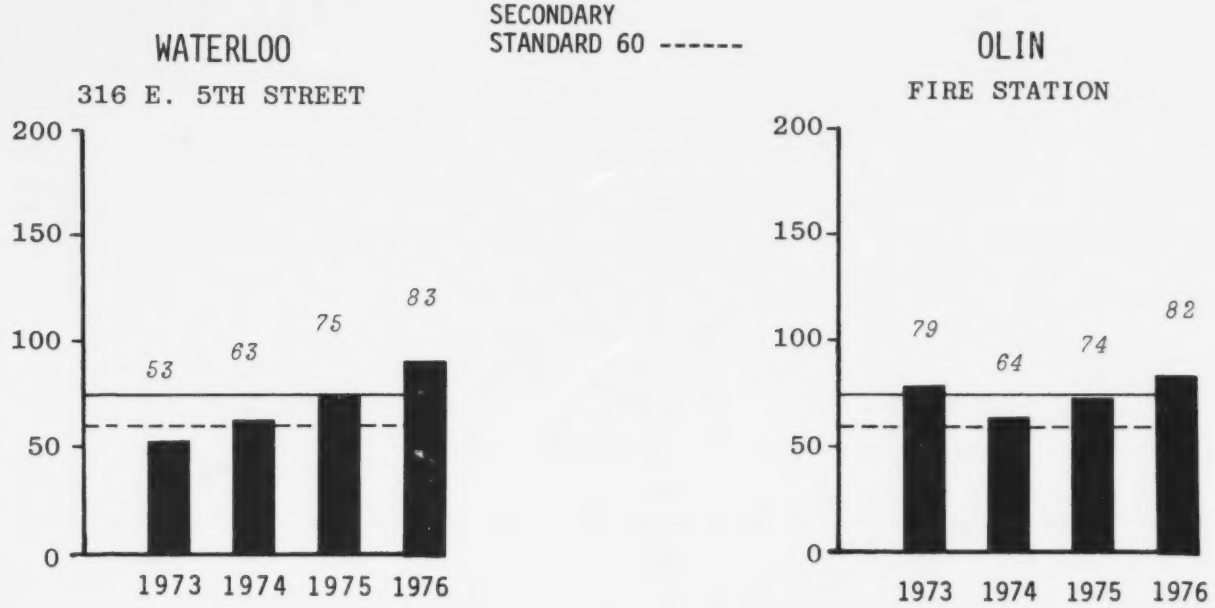
*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

≳ Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ———

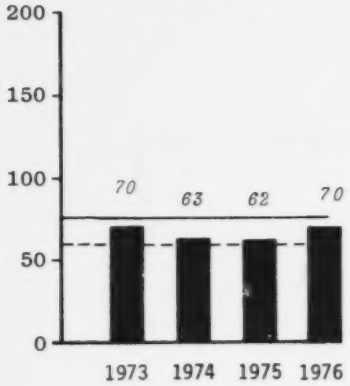
SECONDARY STANDARD 60 ------



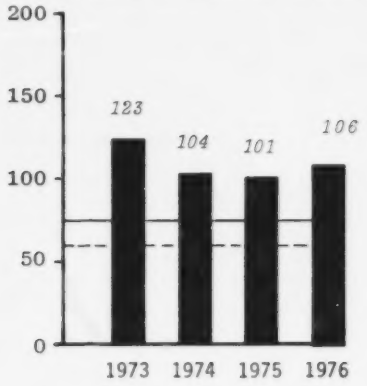
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ——— SECONDARY STANDARD 60 ------

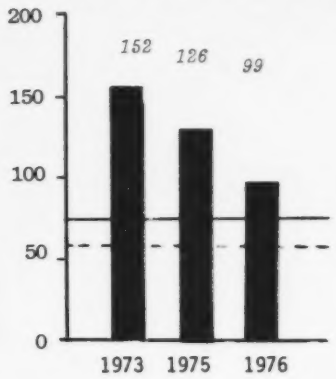
CEDAR RAPIDS
NOELRIDGE PARK



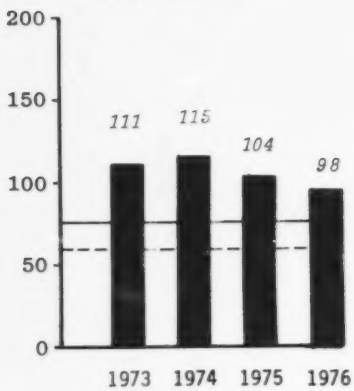
CEDAR RAPIDS
JANE BOYD COMMUNITY CENTER



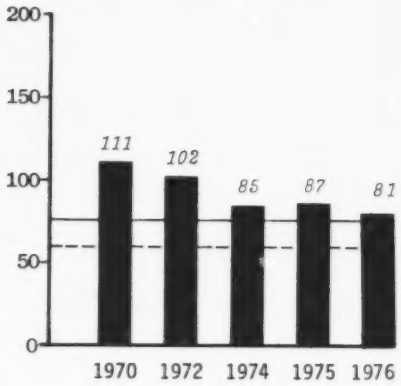
CEDAR RAPIDS
LINN COUNTY HEALTH DEPT.



CEDAR RAPIDS
CITY GARAGE

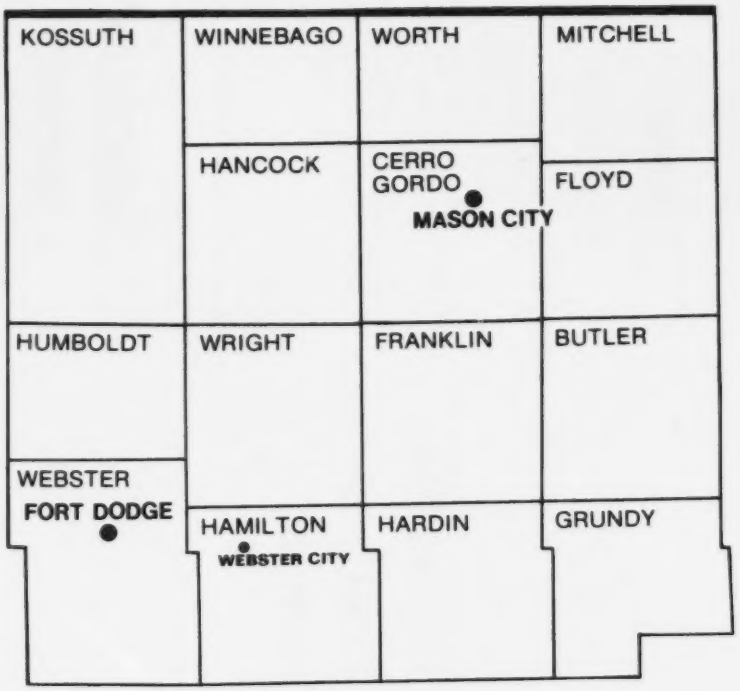


CEDAR RAPIDS
CITY GARAGE (EPA)



AQCR 089

NORTHCENTRAL IOWA INTRASTATE



MASON CITY

3 Particulate Hi-Volume

1 SO_2 Bubbler

1 Particulate - Tape

FORT DODGE

2 Particulate Hi-Volume

WEBSTER CITY

1 Particulate Hi-Volume

AQCR 089 NORTH CENTRAL INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Cerro Gordo County				
Mason City Water Plant	339 - 13th St. NE	SHL	Hi-Vol Tape Sampler SO_2 - Bubbler	Industrial
Mason City Water Tower	14th & South Kentucky Ave.	SHL	Hi-Vol	Residential
Mason City Central Fire Station	Fifth & South Madison	SHL	Hi-Vol	Commercial
Hamilton County				
Webster City T. Loring Farm	Rural Route	SHL	Hi-Vol	Rural
Webster County				
Fort Dodge Municipal Water Plant	Phinney Park Dr.	SHL	Hi-Vol	Industrial
Fort Dodge Highland Park School	9th Ave. South & 25th Street	SHL	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max 24 Hr.	No. of Samples ≥ 24 Hr. Std. Secondary	No. of Samples ≥ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Cerro Gordo County									
Mason City Water Plant	1970*	20	229.0	219.0	6	0	115	101	1.69
	1971	36	705.0	479.0	15	3	152	119	2.01
	1972	55	598.0	562.0	16	8	167	131	1.99
	1973	39	882.0	502.0	17	8	161	118	2.12
	1974	58	430.0	374.0	25	11	158	123	2.04
	1975	58	348.0	294.0	13	2	113	98	1.71
	1976	58	434.0	379.0	15	3	124	108	1.71

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

+Standard Geometric Deviation

≥Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max 24 Hr.	No. of Samples ≥ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Cerro Gordo County									
Mason City Water Tower	1973	43	231.0	218.0	4	0	88	76	1.72
	1974	62	257.0	210.0	6	0	86	74	1.77
	1975	57	292.0	254.0	3	1	71	62	1.64
	1976	60	284.0	246.0	3	1	83	72	1.77
Mason City Fire Station	1976	58	295.0	288.0	3	2	98	89	1.60
Hamilton County									
Webster City T. Loring Farm	1973	45	168.0	160.0	3	0	75	64	1.79
	1974	61	359.0	311.0	10	4	82	58	2.32
	1975	54	242.0	187.0	3	0	60	48	1.90
	1976*	42	234.0	193.0	5	0	83	67	2.08
Webster County									
Fort Dodge Municipal Water Plant	1973	43	139.8	111.3	0	0	58	52	1.59
	1974	57	141.0	132.0	0	0	57	51	1.65
	1975	59	360.0	138.0	1	1	53	42	1.92
	1976	61	138.0	108.0	0	0	48	41	1.79
Fort Dodge Highland Park School	1976*	46	542.0	366.0	4	2	107	90	1.70

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Cerro Gordo County					
Mason City Water Plant	1973*	1277	1.52	1.36	0.18
	1974	2461	1.18	0.65	0.09
	1975*	1664	1.40	1.40	0.10
	1976*	1998	0.48	0.44	0.08

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≥Represents greater than.

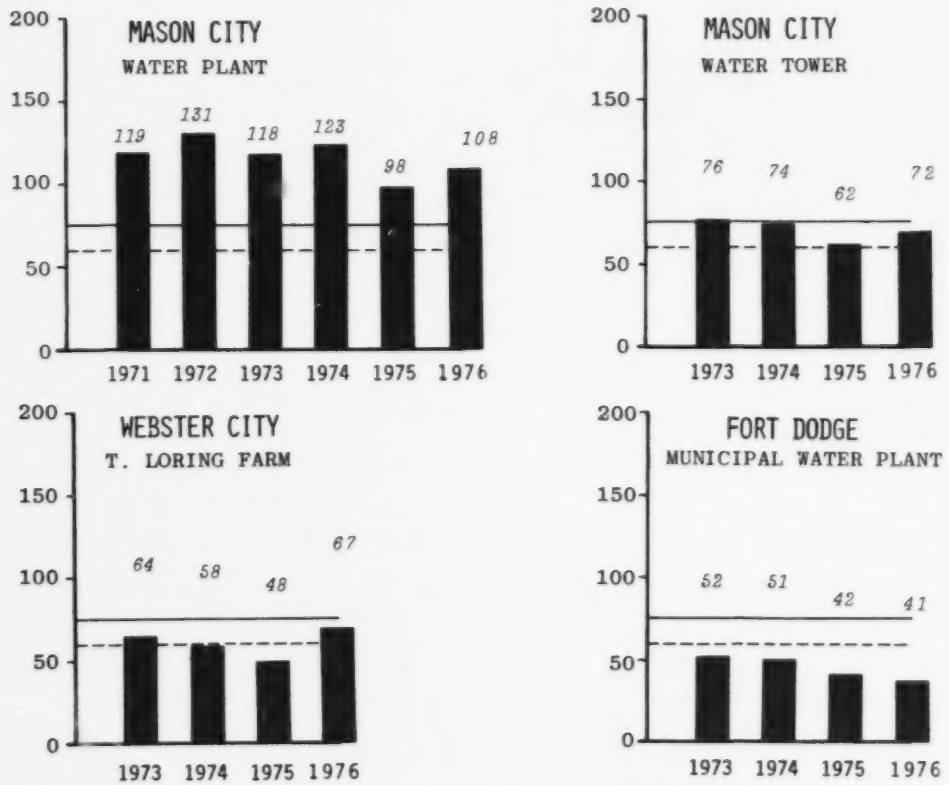
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Cerro Gordo County						
Mason City Water Plant	1973*	40	109.0	83.8	0	6.8
	1974	59	362.0	272.0	0	25.7
	1975	51	622.0	291.0	1	30.5
	1976	59	157.0	86.2	0	14.6

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
≥Represents greater than.

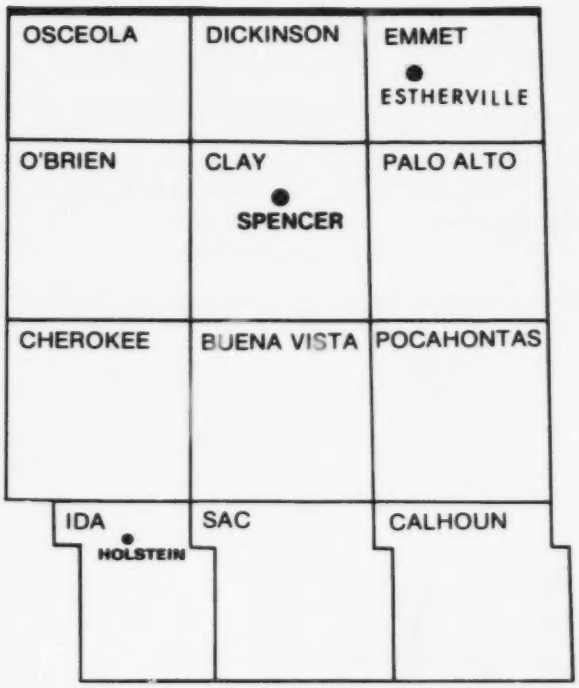
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ——— SECONDARY STANDARD 60 ------



AQCR 090

NORTHWEST IOWA INTRASTATE



SPENCER

1 Particulate Hi-Volume

HOLSTEIN

1 Particulate Hi-Volume

ESTHERVILLE

1 Particulate Hi-Volume

AQCR 090 NORTHWEST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Clay County				
Spencer Hospital	1st Ave. E. & 11th St.	SHL	Hi-Vol SO_2 - Bubbler	Residential
Emmet County				
Estherville Community College	Iowa Lakes Community College	SHL	Hi-Vol	Residential
Ida County				
Holstein City Center	510 Merkley	SHL	Hi-Vol	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std. Secondary	No. of Samples ≥24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Clay County									
Spencer Hospital	1973	43	251.0	161.0	2	0	80	68	1.78
	1974	59	220.0	166.0	4	0	71	60	1.83
	1975	61	311.0	210.0	4	1	70	58	1.87
	1976	59	321.0	159.0	2	1	66	55	1.87
Emmet County									
Estherville Community College	1976*	13	356.0	85.7	1	1	67	46	2.10
Ida County									
Holstein 510 Merkley	1975	34	115.0	109.0	0	0	45	39	1.74
	1976*	43	69.9	67.3	0	0	39	33	1.82

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≥Represents greater than.

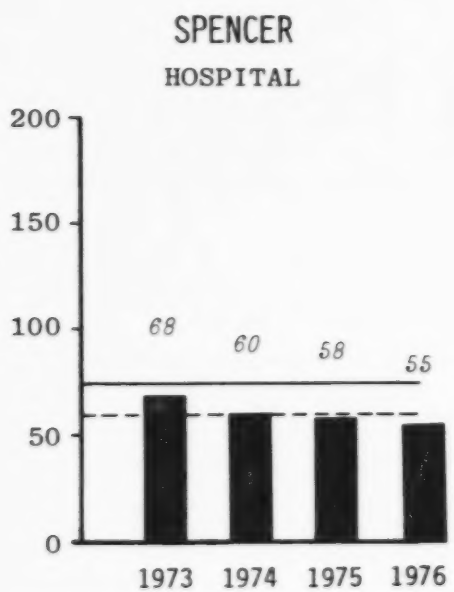
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Clay County						
Spencer Hospital	1973*	22	0.0	0.0	0	0.0
	1974	60	25.7	12.5	0	4.8
	1975	58	12.5	12.5	0	5.8
	1976	59	12.5	12.5	0	6.4

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≥Represents greater than.

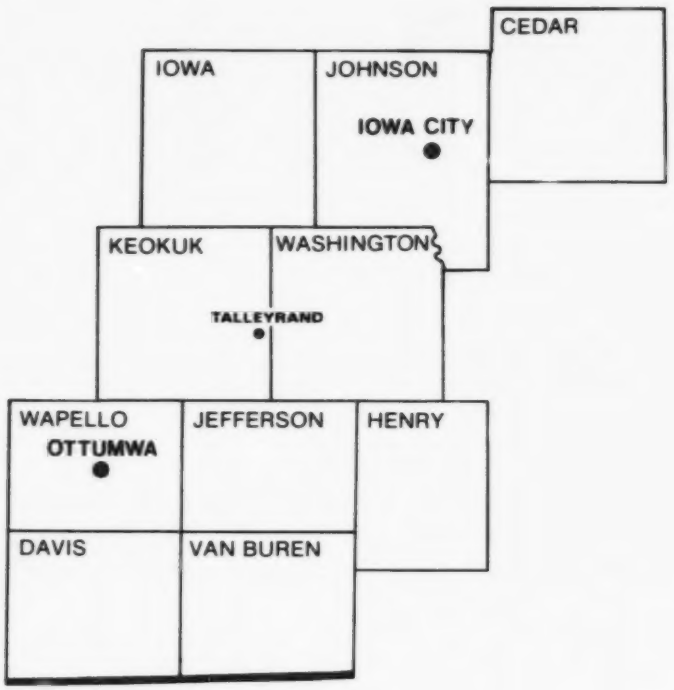
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ——— SECONDARY STANDARD 60 ------



AQCR 091

SOUTHEAST IOWA INTRASTATE



IOWA CITY

1 Particulate Hi-Volume

1 SO_2 Bubbler

OTTUMWA

2 Particulate Hi-Volume

1 SO_2 Bubbler

TALLEYRAND

1 Particulate Hi-Volume

AQCR 091 SOUTHEAST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Johnson County				
Iowa City Medical Lab. Bldg.	University of Iowa	SHL	Hi-Vol SO_2 - Bubbler	Commercial
Keokuk County				
Talleyrand Cochran Farm	Rural Route	SHL	Hi-Vol	Rural
Wapello County				
Ottumwa City Hall	Fourth & Market Sts.	SHL	Hi-Vol SO_2 - Bubbler	Commercial
Ottumwa Douma School	Schuyler & Mary Sts.	SHL	Hi-Vol	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max 24 Hr.	No. of Samples ≳ 24 Hr. Std. Secondary	No. of Samples ≳ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Johnson County									
Iowa City Medical Lab. Building	1971*	9	154.0	84.0	1	0	63	54	1.81
	1972	54	388.0	323.0	4	2	97	87	1.53
	1973	46	480.0	194.0	5	1	96	81	1.76
	1974	60	151.0	130.0	1	0	65	57	1.70
	1975	58	140.0	134.0	0	0	72	66	1.51
	1976	61	352.0	316.0	3	2	98	86	1.64

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≳Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.		Arith. Mean	Geo. Mean	SGD+
					Secondary	Primary			
Keokuk County									
Talleyrand Cochran Farm	1973	46	296.9	198.2	2	1	56	46	1.96
	1974	59	193.0	193.0	8	0	82	68	1.90
	1975	56	214.0	175.0	2	0	56	47	1.82
	1976	61	266.0	178.0	2	1	66	56	1.82
Wapello County									
Ottumwa City Hall	1974*	44	313.0	210.0	3	1	91	79	1.73
	1975	59	188.0	160.0	4	0	87	78	1.60
	1976	59	333.0	167.0	3	1	92	84	1.56
Ottumwa Douma School	1976*	38	235.0	140.0	1	0	71	65	1.51

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Johnson County						
Iowa City Medical Lab. Building	1973*	42	134.6	94.2	0	9.5
	1974	58	212.0	123.0	0	13.7
	1975	57	53.0	47.4	0	11.4
	1976	59	73.1	67.2	0	12.3
Wapello County						
Ottumwa City Hall	1974*	17	20.6	12.5	0	5.6
	1975	53	12.5	12.5	0	4.5
	1976	60	12.5	12.5	0	5.4

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.
+Standard Geometric Deviation
≥ Represents greater than.

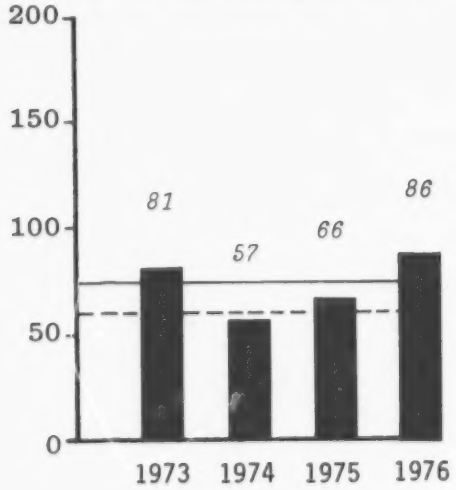
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY
STANDARD 75 ———

SECONDARY
STANDARD 60 ------

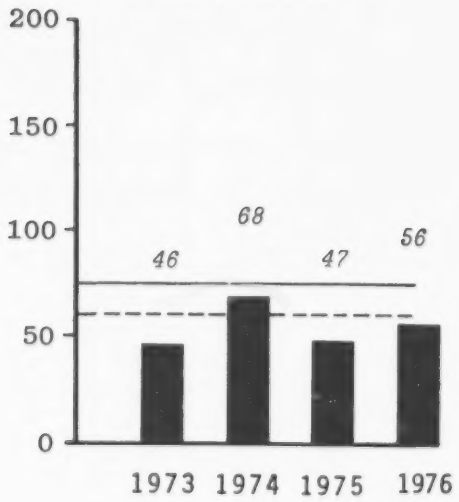
IOWA CITY

MEDICAL LABORATORY BLDG.



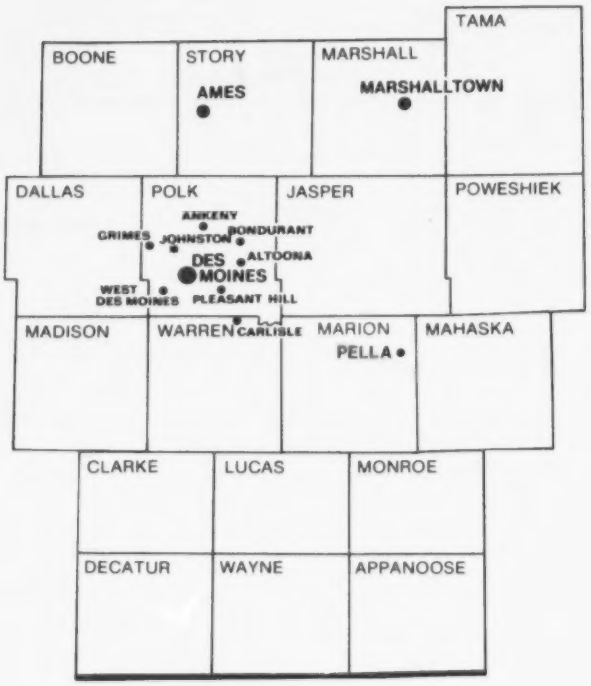
TALLEYRAND

COCHRAN FARM



AQCR 092

SOUTHCENTRAL IOWA INTRASTATE



AMES
- 1 Particulate Hi-Volume
- 1 SO_2 Bubbler
- 1 SO_2 Continuous

MARSHALLTOWN
- 3 Particulate Hi-Volume
- 2 Particulate - Tape

PELLA
- 1 Particulate Hi-Volume
- 2 SO_2 Bubbler

ALTOONA
- 1 Particulate Hi-Volume
- 1 Sulfate

ANKENY
- 1 Particulate Hi-Volume
- 1 Sulfate

DES MOINES*
- 10 Particulate Hi-Volume
- 1 Particulate - Tape
- 9 SO_2 Bubbler
- 2 SO_2 Continuous
- 8 NO_x Bubbler
- 2 CO Continuous
- 1 Ozone
- 4 Sulfate

GRIMES
- 1 Particulate Hi-Volume

JOHNSTON *
- 2 Particulate Hi-Volume

PLEASANT HILL
- 1 Particulate Hi-Volume
- 1 SO_2 Bubbler
- 1 NO_x Bubbler
- 1 Sulfate

CARLISLE
- 1 SO_2 Bubbler
- 1 SO_2 Continuous
- 1 NO_x Bubbler

BONDURANT
- 1 Ozone

WEST DES MOINES
- 2 Particulate Hi-Volume

*Represents the number of sampling sites which were used during 1975 and not the number of discrete instruments.

AQCR 092 - SOUTHCENTRAL IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Marion County				
Pella Pella D.X. Station	414 Oskaloosa St.	SHL	SO_2 Bubbler	Industrial
Pella Pella Christian School	216 Liberty St.	SHL	Hi-Vol SO_2 Bubbler	Residential
Marshall County				
Marshalltown Water Plant	911 N. Center St.	SHL	Hi-Vol Tape Sampler	Residential
Marshalltown Marshalltown Mfg.	710 South 12th St.	SHL	Hi-Vol	Industrial
Marshalltown City Hall	State & Center Sts.	SHL	Hi-Vol Tape Sampler	Commercial
Polk County				
Altoona Water Works Bldg.	105 3rd St.	DMPC	Hi-Vol Sulfate	Commercial
Ankeny Water Works Garage	408 3rd St.	DMPC	Hi-Vol Sulfate	Commercial
Des Moines Fire Station #1	Ninth & Mulberry	DMPC EPA	Hi-Vol Sulfate Hi-Vol SO_2 Bubbler NO_2 Bubbler	Commercial
Des Moines Fire Station #17	2217 Beaver	DMPC	Hi-Vol	Residential
Des Moines Fire Station #8	1249 McKinley	DMPC	Hi-Vol Sulfate	Residential
Des Moines Des Moines Building	6th & Locust	DMPC	CO Continuous	Commercial
Des Moines Smith-Voorhees	1040 Fifth Ave.	DMPC	SO_2 Bubbler NO_2 Bubbler	Commercial

Site Location	Address	Agency	Equipment	Environment
Polk County				
Des Moines Iowa Police Radio Station	5912 Second Ave.	DMPC	Ozone	Residential
Des Moines Industrial Park	5299 N.E. 15th	DMPC	Hi-Vol	Commercial
Des Moines Shell Oil Bldg.	302 S.E. 18th St.	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler Sulfate	Industrial
Des Moines Blood Bank Garage	Eighth & Interstate 235	DMPC	SO_2 Bubbler NO_2 Bubbler	Commercial
Des Moines Texaco Bulk Station	600 S.E. 18th	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler Sulfate	Industrial
Des Moines YWCA	Eighth & Grand	DMPC	CO Continuous	Commercial
Des Moines National By-Products	S.E. 18th & Scott	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler	Industrial
Des Moines Trailer	Fairgrounds	SHL	SO_2 Continuous	Residential
Des Moines Trailer	E. 18th & Dean	SHL DMPC	SO_2 Continuous Hi-Vol SO_2 Bubbler NO_2 Bubbler Sulfate	Commercial
Des Moines State Hygienic Lab.	E. 7th & Court	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Des Moines Fire Station #5	42nd Street & Interstate 235	DMPC	SO_2 Bubbler NO_2 Bubbler	Residential
Carlisle Water Lift Station	S.E. Avon Drive	SHL DMPC	SO_2 Continuous SO2 Bubbler NO_2 Bubbler	Rural

Site Location	Address	Agency	Equipment	Environment
Grimes Fire Station	404 S. 2nd St.	DMPC	Hi-Vol	Commercial
Pleasant Hill Sewage Treatment Plant	5440 Vandalia Rd.	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler Sulfate	Rural
Johnston Garden Club	5560 Merle Hay Road	DMPC	Hi-Vol	Residential
Johnston City Hall	5765 Merle Hay Road	DMPC	Hi-Vol	Commercial
Bondurant Farrar School	300 Garfield, S.W.	DMPC	Ozone	Residential
West Des Moines Crestview Acres	916 Ashworth	DMPC	Hi-Vol	Residential
West Des Moines Water Works Plant	1505 Railroad	DMPC	Hi-Vol	Commercial
Story County				
Ames Meeker School	20th & Burnett	SHL	Hi-Vol SO_2 Bubbler	Residential
Ames Greenhouse	505 S. Maple	SHL	SO_2 Continuous	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std. Secondary	No. of Samples ≳ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Marion County									
Pella Pella Christian School	1976	55	121.0	109.0	0	0	62	55	1.73

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
+Standard Geometric Deviation
≳Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.		Arith. Mean	Geo Mean	SGD+
					Secondary	Primary			
Marshall County									
Marshalltown Water Plant	1973	59	269.0	224.0	6	1	79	65	1.85
	1974	60	397.0	371.0	10	3	104	84	1.86
	1975	59	401.0	172.0	4	1	87	74	1.73
	1976	45	403.0	330.0	8	3	109	84	2.20
Marshalltown City Hall	1976*	16	137.0	118.0	0	0	67	57	2.03
Marshalltown Marshalltown Mfg.	1976*	13	304.0	153.0	2	1	107	94	1.65
Polk County									
Altoona Water Works Bldg.	1973	60	311.0	260.4	9	2	95	79	1.80
	1974	61	212.6	167.2	3	0	79	72	1.58
	1975	60	235.0	169.1	3	0	79	70	1.66
	1976	61	288.9	250.9	3	1	82	71	1.74
Ankeny Water Works Garage	1973	58	168.9	159.8	3	0	83	74	1.62
	1974	61	179.9	176.8	8	0	86	78	1.61
	1975	57	245.8	228.3	6	0	91	79	1.73
	1976	59	297.0	262.8	3	2	90	81	1.61
Des Moines Fire Station #1 (DMPC)	1969*	19	257.9	247.0	8	0	147	138	1.50
	1970	25	279.9	268.0	13	2	153	140	1.60
	1971	26	266.2	248.9	12	1	136	124	1.56
	1972	57	299.6	227.3	12	1	102	89	1.73
	1973	58	479.7	424.1	13	3	121	102	1.78
	1974	61	540.2	231.7	11	1	108	99	1.63
	1975	60	242.5	216.2	10	0	108	96	1.64
	1976	60	446.9	310.5	10	2	112	98	1.69

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
+Standard Geometric Deviation
≥Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std. Secondary	No. of Samples ≥ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Polk County									
Des Moines Fire Station #1 (EPA)	1957	26	458.0	-	-	-	176	160	1.53
	1958	26	360.0	-	-	-	165	152	1.50
	1959	25	462.0	-	-	-	174	159	1.55
	1960	25	329.0	-	-	-	183	164	1.63
	1961	24	392.0	-	-	-	130	119	1.50
	1962	26	291.0	-	-	-	128	116	1.58
	1963	25	351.0	-	-	-	127	110	1.71
	1964	25	299.0	-	-	-	128	117	1.55
	1965	25	313.0	-	-	-	142	127	1.60
	1966	25	242.0	-	-	-	123	114	1.51
	1967	25	258.0	-	-	-	117	108	1.47
	1968*	16	240.0	-	-	-	100	90	1.60
	1969	25	214.0	201.0	5	0	103	91	1.67
	1970	24	193.0	172.0	4	0	102	94	1.51
	1971	26	255.0	147.0	1	0	98	86	1.85
	1972	28	202.0	159.0	2	0	92	85	1.48
	1973*	3	108.0	56.0	0	0	67	61	1.55
	1974	29	367.0	166.0	2	1	89	75	1.76
	1975	36	181.0	159.0	2	0	71	63	1.64
	1976	48	226.0	160.0	2	0	77	70	1.53
Des Moines Fire Station #17	1969*	19	149.1	146.5	0	0	86	78	1.60
	1970	22	176.4	140.9	1	0	93	88	1.38
	1971	23	266.9	219.7	3	1	109	98	1.51
	1972	57	148.8	122.8	0	0	74	69	1.44
	1973	62	618.8	198.2	5	1	95	81	1.64
	1974	58	194.2	143.0	1	0	74	69	1.52
	1975	57	164.7	155.5	2	0	84	78	1.46
	1976	60	362.5	307.2	4	2	94	83	1.60
Des Moines Fire Station #8	1973	61	188.2	186.2	3	0	81	73	1.60
	1974	60	179.6	167.0	2	0	71	65	1.54
	1975	60	194.4	156.8	2	0	83	74	1.65
	1976	61	280.9	261.3	6	2	90	79	1.63
Des Moines Industrial Park	1969*	4	152.5	123.1	1	0	111	106	1.41
	1970	26	291.0	208.9	5	1	105	90	1.72
	1971	35	227.9	220.9	10	0	113	95	1.74
	1972	57	301.6	290.3	10	2	97	82	2.02
	1973	58	265.7	258.0	12	1	98	82	1.81
	1974	60	838.5	666.7	18	6	140	106	2.03
	1975	59	728.3	615.5	19	10	163	115	2.20
	1976	61	652.9	410.3	22	6	155	129	1.85

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

+Standard Geometric Deviation

≥Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std. Secondary	No. of Samples ≥ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Polk County									
Des Moines 302 S.E. 18th St.	1972*	35	283.6	249.3	7	1	115	102	1.64
	1973	58	324.5	243.6	13	1	111	97	1.69
	1974	62	413.4	379.1	21	10	145	121	1.86
	1975	57	326.8	288.2	17	4	129	110	1.80
	1976*	8	271.8	140.8	1	1	114	94	1.97
Des Moines State Hygienic Lab	1971*	15	182.0	-	-	-	68	62	2.00
	1972	44	161.0	160.0	2	0	74	65	1.79
	1973	62	211.0	204.0	7	0	84	69	1.99
	1974	60	206.0	178.0	4	0	80	70	1.78
	1975	57	233.0	192.0	4	0	84	73	1.74
	1976	57	223.0	221.0	4	0	80	69	1.72
Des Moines National By Products	1976*	5	147.8	109.1	0	0	110	108	1.19
Des Moines E. 18th & Dean	1976*	26	172.5	157.8	2	0	86	76	1.71
Des Moines Texaco Bulk Station	1976*	18	298.4	284.1	12	2	172	166	1.32
Grimes Fire Station	1973	59	291.0	281.2	10	2	98	81	1.85
	1974	61	308.6	172.4	6	1	91	80	1.63
	1975	59	280.4	200.7	12	1	98	83	1.83
	1976	61	544.8	292.7	12	3	120	102	1.75
Pleasant Hill Sewage Treatment Plant	1973	61	191.8	189.7	2	0	70	61	1.70
	1974	58	180.3	163.2	2	0	60	55	1.55
	1975	60	146.6	139.1	0	0	58	51	1.68
	1976	60	236.2	179.0	2	0	62	49	2.14
Johnston Garden Club	1973	61	972.2	464.4	5	3	97	70	2.00
	1974	60	522.3	467.9	8	4	101	77	1.99
	1975	60	295.5	226.9	5	1	79	66	1.80
	1976*	46	368.2	344.9	5	3	101	81	1.89

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
+Standard Geometric Deviation
≥Represents greater than.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std. Secondary	No. of Samples ≥ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Polk County									
Johnston City Hall	1976*	14	354.2	173.6	2	1	111	97	1.63
West Des Moines Crestview Acres	1969*	19	231.0	155.7	3	0	105	90	1.88
	1970	24	217.9	170.0	4	0	102	89	1.84
	1971	23	243.4	207.5	4	0	99	90	1.74
	1972	56	196.2	194.4	2	0	70	58	1.67
	1973	61	292.5	240.1	4	1	78	68	1.65
	1974	59	296.1	201.0	4	1	79	70	1.64
	1975	60	156.8	149.1	1	0	71	63	1.69
	1976	61	315.2	214.8	5	1	82	67	1.93
West Des Moines Water Works Plant	1976	58	375.5	342.1	17	4	124	101	1.97
Story County									
Ames Meeker School	1976	59	294.0	183.0	2	1	67	57	1.72

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Marshall County					
Marshalltown Water Plant	1973	2293	0.65	0.57	0.08
	1974	3579	0.82	0.82	0.09
	1975	3430	1.13	1.00	0.10
	1976	2190	1.00	0.74	0.08
Marshalltown City Hall	1976	91	0.40	0.32	0.09

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
+Standard Geometric Deviation
≥ Represents greater than.

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES (CONTINUED)
(COHS/1000 Linear Feet)

Site Location	Year	No. of Samples	Max. 2 Hr.	2nd Max. 2 Hr.	Arith. Mean
Polk County					
Des Moines State Hygienic Lab	1973	3304	1.00	0.87	0.11
	1974	3545	1.36	1.00	0.17
	1975	2876	1.00	0.95	0.13
	1976	2381	1.09	0.95	0.11

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥24 Hr. Std.	Arith. Mean
Marion County						
Pella Pella Christian School	1976	56	118.0	102.0	0	11.9
Polk County						
Des Moines Fire Station #1 (EPA)	1961*	15	236.0	-	0	27.0
	1962	26	367.0	-	1	52.0
	1963	24	79.0	-	0	21.0
	1964	24	39.0	-	0	12.0
	1965	24	67.0	-	0	11.0
	1966	23	36.0	-	0	13.0
	1967	26	69.0	-	0	15.0
	1968	25	33.0	-	0	11.0
	1969	24	95.0	-	0	17.0
	1970	26	59.0	-	0	11.0
	1971	24	16.0	-	0	5.0
	1972*	15	28.0	-	0	7.0
	1973*	4	6.0	3.0	0	2.8
	1974	28	33.0	12.0	0	5.5
	1975	31	51.0	49.0	0	12.5
	1976	46	22.0	21.0	0	6.2

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
≥Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Polk County						
Des Moines Smith-Voorhees	1973*	20	99.8	99.8	0	37.0
	1974	45	36.9	26.9	0	12.8
	1975	60	27.6	18.6	0	3.5
	1976*	45	47.7	37.6	0	8.6
Des Moines 302 S.E. 18th St.	1973*	20	114.4	104.0	0	37.1
	1974	45	41.2	30.9	0	12.4
	1975	60	30.4	22.1	0	4.0
	1976*	10	5.1	0.0	0	0.5
Des Moines State Hygienic Lab	1973*	35	57.8	42.7	0	3.4
	1974	61	54.0	21.8	0	6.5
	1975	60	33.4	20.8	0	7.9
	1976	60	116.0	33.4	0	10.8
Des Moines Community Blood Bank	1976*	15	19.5	13.0	0	2.8
Des Moines National By Products	1976*	5	10.3	9.0	0	6.2
Des Moines E. 18th & Dean	1976*	26	55.8	38.0	0	6.6
Des Moines 42nd & I-235	1976*	18	10.5	7.9	0	1.6
Des Moines Texaco Bulk Station	1976*	19	45.6	0.0	0	2.4
Carlisle Water Lift Station	1976	57	81.6	31.5	0	5.6
Pleasant Hill Sewage Treatment Plant	1973*	21	112.3	101.9	0	37.1
	1974	46	34.4	30.1	0	11.2
	1975	59	132.5	31.2	0	5.9
	1976	60	153.3	48.2	0	8.8

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
≥ Represents greater than.

SULFUR DIOXIDE - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Story County						
Ames						
Meeker School	1976	60	67.2	48.1	0	4.8

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 3 Hr.	2nd Max. 3 Hr.	No. of Samples ≥ 3 Hr. Std.	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≥ 24 Hr. Std.	Arith. Mean
Polk County									
Des Moines									
Fairgrounds	1975*	2522	135	83	0	26	22	0	2
	1976*	4325	209	155	0	81	19	0	1
Des Moines									
E. 18th & Dean	1975*	3928	145	132	0	71	38	0	2
	1976	8163	161	160	0	97	72	0	4
Carlisle									
Water Lift									
Station	1975*	3619	197	167	0	119	103	0	3
	1976	8671	177	163	0	124	97	0	2
Story County									
Ames									
Greenhouse	1975*	491	290	264	0	140	20	0	8
	1976	7646	645	605	0	427	340	1	1.5

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
≥Represents greater than.

NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	Violation of Annual Standard	Arith. Mean
Polk County						
Des Moines Fire Station #1 (EPA)	1967*	12	66.0	-	No	26.0
	1968	23	34.0	-	No	17.0
	1969	23	26.0	-	No	12.0
	1970*	7	13.0	-	No	10.0
	1973*	4	133.0	65.0	No	66.5
	1974	27	106.0	73.0	No	43.6
	1975	34	70.0	62.0	No	40.1
	1976	52	80.0	79.0	No	48.9
Des Moines Smith-Voorhees	1973*	33	201.7	188.4	No	90.8
	1974	61	141.9	130.7	No	47.5
	1975	60	79.5	77.4	No	39.5
	1976	45	98.9	96.7	No	48.4
Des Moines 302 S.E. 18th St.	1973*	32	144.2	143.2	No	70.2
	1974	61	152.8	119.4	No	32.5
	1975	60	49.1	47.1	No	21.2
	1976*	10	41.2	37.3	No	27.7
Des Moines Community Blood Bank	1976*	15	68.7	28.3	No	15.1
Des Moines National By Products	1976*	5	49.8	49.8	No	38.3
Des Moines E. 18th & Dean	1976*	26	47.2	45.2	No	26.0
Des Moines 42nd & I-235	1976*	18	52.4	48.2	No	39.1
Des Moines Texaco Bulk Station	1976*	20	45.8	39.3	No	25.9
Carlisle Water Lift Station	1976	59	46.0	26.0	No	11.8
Pleasant Hill Sewage Treatment Plant	1973	33	248.3	139.0	No	58.7
	1974	56	139.0	129.1	No	23.6
	1975	58	38.8	36.8	No	14.0
	1976	59	33.0	30.6	No	16.3

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ≥ 1 Hr. Std.	Max. 8 Hr.	2nd Max. 8 Hr.	No. of Samples ≥ 8 Hr. Std.	Arith. Mean
Polk County									
Des Moines									
Des Moines Bldg.	1976	7727	26.5	21.5	0	17.3	11.9	9	2.47
Des Moines									
YWCA	1976*	743	22.5	22.0	0	10.9	10.5	5	3.01

OZONE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 1 Hr.	2nd Max. 1 Hr.	No. of Samples ≥ 1 Hr. Std.	Arith. Mean
Polk County						
Des Moines						
Iowa Police Radio						
Station	1971*	4017	210	200	16	-
	1972*	3120	160	160	0	-
	1973*	627	110	110	0	29
	1974	7065	160	160	0	37
	1975	7913	198	194	22	48
	1976	7395	204	202	156	63
Bondurant						
Farrar School	1974*	2324	64	64	0	18
	1975	8491	200	200	127	56
	1976	8521	230	228	257	65

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.
≥Represents greater than.

SULFATE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

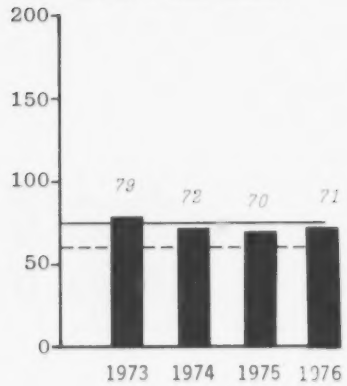
Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	Arith. Mean
Polk County					
Altoona					
Water Works Bldg.	1975*	17	5.2	3.8	1.9
	1976*	38	4.1	3.8	1.1
Ankeny					
Water Works Garage	1976*	19	2.4	1.2	0.7
Des Moines					
Fire Station #1	1975*	17	16.7	6.2	3.2
	1976	56	3.8	2.9	1.1
Des Moines					
Fire Station #8	1975*	15	5.3	4.4	1.7
	1976	58	3.8	3.5	1.1
Des Moines					
302 S.E. 18th	1975*	17	5.1	5.1	2.4
	1976*	6	2.1	1.4	1.2
Des Moines					
E. 18th & Dean	1976*	26	3.8	2.1	1.0
Des Moines					
600 S.E. 18th	1976*	18	5.8	4.1	1.8
Pleasant Hill					
Sewage Treatment Plant	1975*	14	4.5	4.3	2.1
	1976	58	3.6	2.5	0.9

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

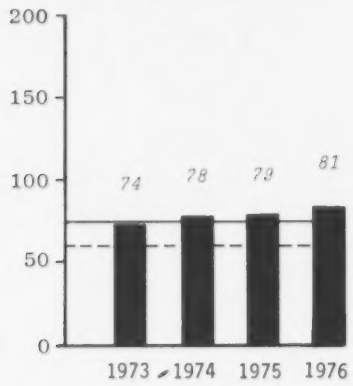
GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY STANDARD 75 ——— SECONDARY STANDARD 60 ------

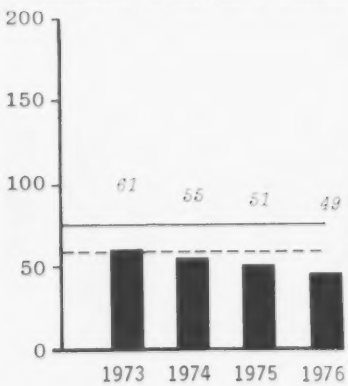
ALTOONA
WATER WORKS BLDG.



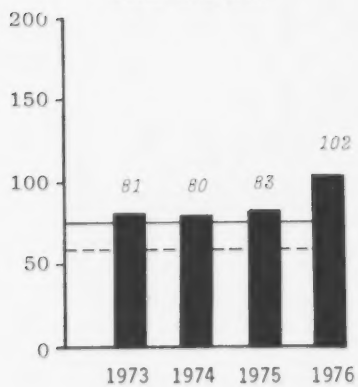
ANKENY
WATER WORKS GARAGE



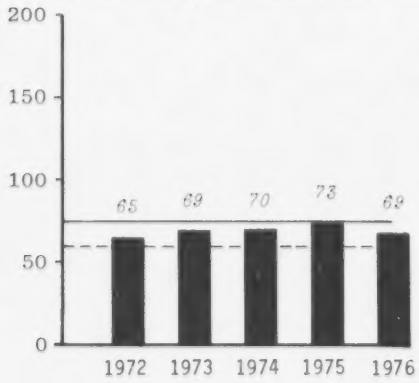
PLEASANT HILL
SEWAGE TREATMENT PLANT



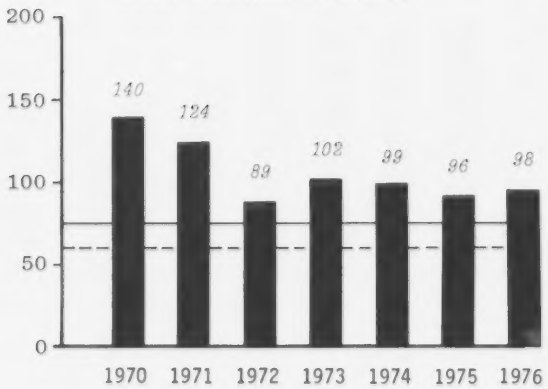
GRIMES
FIRE STATION



DES MOINES
STATE HYGIENIC LABORATORY



DES MOINES
FIRE STATION #1 (DMPC)

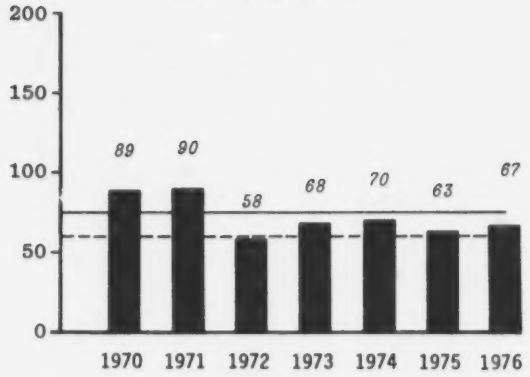


GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

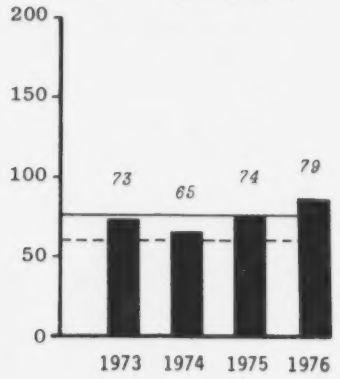
PRIMARY
STANDARD 75 ———

SECONDARY
STAMDARD 60 ------

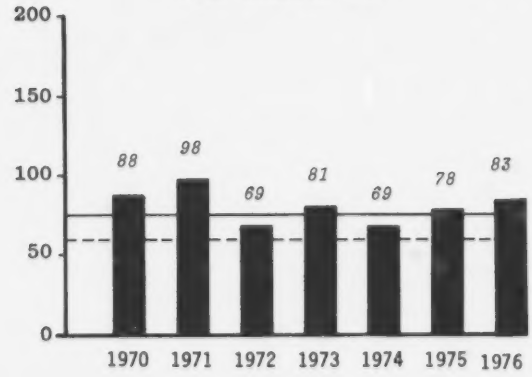
WEST DES MOINES
CREST VIEW ACRES



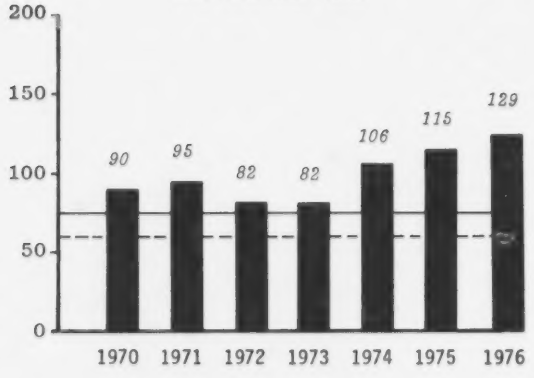
DES MOINES
FIRE STATION #16



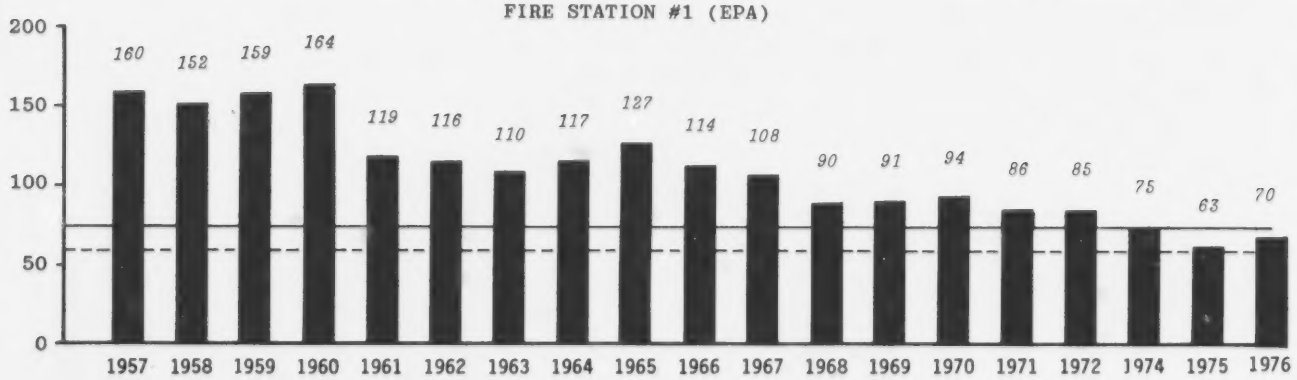
DES MOINES
FIRE STATION #17



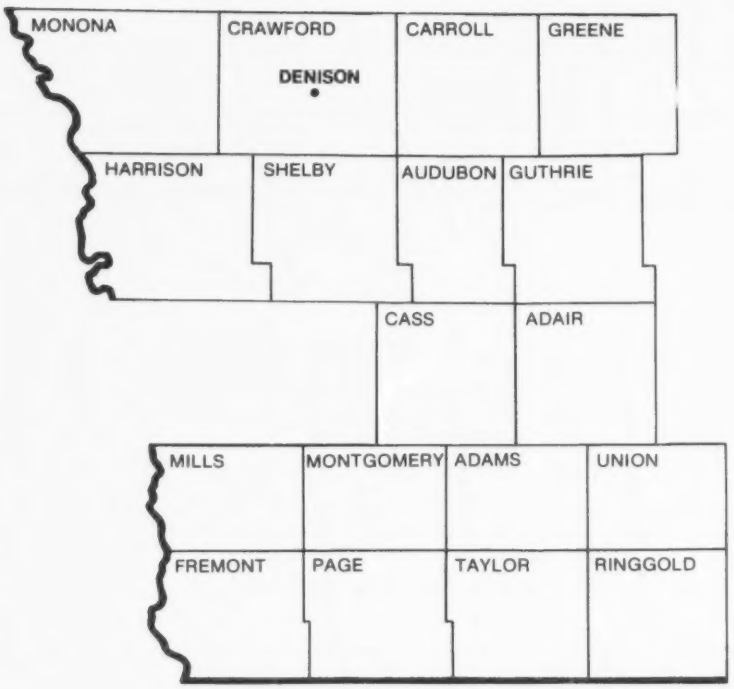
DES MOINES
INDUSTRIAL PARK



DES MOINES
FIRE STATION #1 (EPA)



AQCR 093
SOUTHWEST IOWA INTRASTATE



Denison

1 Particulate Hi-Volume
1 SO_2 Bubbler

AQCR 093 - SOUTHWEST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Crawford County				
Denison Municipal Water Plant	U.S. 59 & Ia. 141	SHL	Hi-Vol SO_2 - Bubbler	Rural

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std. Secondary	No. of Samples ≳ 24 Hr. Std. Primary	Arith. Mean	Geo. Mean	SGD+
Crawford County									
Denison Municipal Water Plant	1972*	6	48.0	44.0	0	0	35	34	1.29
	1973	43	198.0	193.0	2	0	82	73	1.66
	1974	58	311.0	284.0	5	2	75	58	2.10
	1975	56	153.0	148.0	1	0	66	56	1.80
	1976	58	325.0	191.0	5	1	82	68	1.90

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	No. of Samples	Max. 24 Hr.	2nd Max. 24 Hr.	No. of Samples ≳ 24 Hr. Std.	Arith. Mean
Crawford County						
Denison Municipal Water Plant	1973*	38	0.0	0.0	0	0.0
	1974	55	15.4	12.8	0	3.5
	1975	55	12.5	12.5	0	4.4
	1976	59	12.5	12.5	0	3.8

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

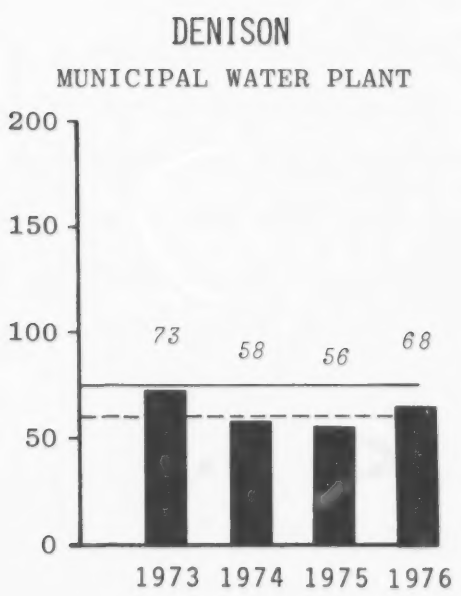
+Standard Geometric Deviation

≳Represents greater than.

GRAPHICAL TRENDS OF ANNUAL GEOMETRIC MEANS OF SUSPENDED PARTICULATES
MICROGRAMS PER CUBIC METER

PRIMARY
STANDARD 75 ———

SECONDARY
STANDARD 60 ------



V. STATEWIDE DATA ANALYSIS AND TRENDS

Suspended Particulates

An abrupt turn-around in suspended particulate trends occurred during 1976. Thirty-five, or over three fourths, of the forty-six stations with valid annual data recorded higher annual geometric means when compared with the previous year. Sixty percent of these sites had increases from 1-10 micrograms per cubic meter. Table II shows the trends between 1973 and 1974, 1974 and 1975, and 1975 and 1976 for Hi-Volume sampling sites.

Statewide rankings of Hi-Volume sampling sites are displayed in Table III and Table IV. Table III ranks monitoring sites in order of annual geometric means while Table IV ranks the sites by the number of standard violations.

The upward trend in suspended particulate levels is believed to primarily be the result of an unusually dry period from July to December. Statewide precipitation levels averaged more than eight inches below normal for the last six months of 1976. This lack of moisture along with strong winds increased the background dust concentrations and produced elevated particulate levels. An example of this situation was monitored on October 15.

Hi-Volume samplers operating on October 15, 1976 recorded the highest suspended particulate levels for any day in 1976. Thirty-nine of the fifty-two monitors operating that day recorded the maximum value for the year. Thirty-two monitors recorded particulate values in excess of 260 micrograms per cubic meter and forty-seven exceeded 150 micrograms per cubic meter. These high values occurred from a cold front that rapidly

moved through the Midwest producing winds in excess of sixty kilometers per hour. Since rainfall was minimal during the fall and harvesting was nearing completion, the winds easily eroded the topsoil and transported it southeastward. Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin all reported unusually high particulate levels on this day due to this dust laden front.

TABLE II
YEARLY TRENDS OF GEOMETRIC MEANS
FROM HI-VOLUME DATA

Comparison Years	1973-1974	Total	1974-1975	Total	1975-1976	Total
Decrease ($\mu g/m^3$)						
> 15	7		5		2	
11-15	3	21	6	31	0	11
6-10	7		7		5	
0-5	4		13		4	
No Change						
0	1	1	0	0	0	0
Increase ($\mu g/m^3$)						
0-5	3		9		7	
6-10	2	13	5	19	14	35
11-15	2		1		7	
>15	6		4		7	
Total No. of Monitors		35		50		46*

* This represents a reduction in the number of valid annual averages, not the total number of monitoring sites, from 1974-1975 to 1975-1976 due to a more stringent criteria used to determine valid annual data, which was implemented in 1976.

Sulfur Dioxide

No monitoring sites in Iowa violated either the three-hour or annual standard for sulfur dioxide in 1976; however, two sites each had a single value in excess of the twenty-four-hour standard. Comparisons of annual means were made for monitors having two valid years of data (1975 and 1976). For 24-hour gas bubblers, the annual arithmetic mean decreased at five sites and increased at five sites, while one monitor showed no change. Two of the four continuous monitors with valid data showed decreases, while the other two showed increases. No noticeable trends in statewide sulfur dioxide levels can be determined from the 1976 data.

Carbon Monoxide

Four of the five carbon monoxide monitors operating in the state recorded violations of the eight-hour carbon monoxide standard. There were, however, no violations of the one-hour standard. Two monitors operated in Des Moines in 1976; the Des Moines Building (6th and Locust) site exceeded the eight-hour standard nine times, while the YWCA Building site (8th and Grand) exceeded the standard four times. Cedar Rapids recorded three violations in 1976, Davenport one, and Dubuque had no eight-hour standard violations.

The carbon monoxide monitor operated at the Des Moines Building was until 1976 located immediately across Sixth Street at the Bankers Trust Building. The Bankers Trust location recorded sixty-seven violations in 1973, thirty-two in 1974, and sixty-six in 1975. The new Des Moines Building site, however, recorded only nine violations in 1976. Because of the lower values recorded at the Des Moines Building, DEQ conducted special carbon monoxide monitoring on three of the

four corners of Sixth and Locust. The Bankers Trust Building corner was not monitored. During the two weeks of monitoring at each site at least one eight-hour violation was recorded on each corner. None of the three sites, however, were exceptionally different.

Two sites, Dubuque and Cedar Rapids, showed decreases in the number of violations recorded in 1976 when compared to 1975. The remaining three monitors did not operate in 1975. Although the amount of data is not statistically significant, it appears that carbon monoxide violations reversed its previous upward trend the past few years and decreased in 1976. The annual mean also showed a decrease in Cedar Rapids, but increased slightly in Dubuque.

Photochemical Oxidants

Ozone violations increased dramatically for all monitoring sites in Iowa during 1976. The highest one-hour value ever recorded in Iowa, 270 micrograms per cubic meter (.135 ppm), occurred in August in Cedar Rapids and prompted the only alert issued in 1976. The Cedar Rapids monitor recorded 77 violations of the one-hour standard in 1976 compared to zero recorded in 1975. The Des Moines Iowa Police Radio Station monitor recorded 156 violations, seven times as many as recorded in 1975. Two hundred and fifty-seven violations, the highest number of violations at any site, occurred at the Bondurant site during 1976. Davenport had the least number of violations, with twenty-six at the Iowa Highway Patrol Station and three at the new St. Ambrose site. As seen by the increase in violations, there is definitely a trend toward higher ozone levels and more numerous standard violations throughout Iowa.

Nitrogen Dioxide

There were no violations of the annual standard for nitrogen dioxide in 1975. Four gas bubblers had valid data for the year, all of which showed an increase in the annual arithmetic mean.

Hydrocarbons

Only one city in Iowa monitored hycrocarbons in 1976. The three-hour hydrocarbon guideline was exceeded one hundred and twenty times at the Cedar Rapids monitoring site. Additional hydrocarbon monitoring will begin during 1977 in Des Moines.

TABLE 3

RANKING OF HI-VOLUME SAMPLER SITES
BASED ON VALID ANNUAL GEOMETRIC MEANS*

Rank		Site and Location	Annual Geometric Mean (ug/m^3)
1	Keokuk	Water Pollution Control Plant	171.0
2	Des Moines	Industrial Park	129.1
3	Mason City	Water Plant	107.9
4	Cedar Rapids	Jane Boyd Comm. Center	105.6
5	Grimes	Fire Station	102.2
6	West Des Moines	Water Works	100.7
7	Cedar Rapids	Linn County Health Department	98.6
8	Cedar Rapids	City Garages	97.8
9	Des Moines	Fire Station #1	97.7
10	Davenport	Ia. Highway Patrol Station	95.2
11	Davenport	Ia.-Ill. Gas & Electric	93.2
12	Clinton	Sewage Treatment Plant	90.7
13	Mason City	Central Fire Station	88.6
14	Iowa City	Medical Laboratory Building	86.3
15	Ottumwa	City Hall	83.6
16	Des Moines	Fire Station #7	83.2
17	Waterloo	County Courthouse (EPA)	83.1
18	Olin	Fire Station	82.4
19	Ankeny	Water Works Garage	80.7
20	Cedar Rapids	City Garages (EPA)	80.6
21	Des Moines	Fire Station #8	79.5
22	Davenport	Central Fire Station (EPA)	77.1
23	Muscatine	City Hall	76.3
		Primary Standard	75.0
24	Mason City	Water Tower	71.7
25	Altoona	Water Works Bldg.	71.3
26	Cedar Rapids	Noelridge Park	70.4
27	Des Moines	State Hygienic Lab	69.0
28	Denison	Municipal Water Plant	68.4
29	Davenport	Monroe School	67.7
30	West Des Moines	Crestview Acres	67.1
31	Bettendorf	Pleasant Valley School	62.7
32	Rock Rapids	Municipal Utilities Bldg.	61.8
		Secondary Standard	60.0
33	Ames	Meeker School	57.4
34	Talleyrand	Cochran Farm	55.9
35	Pella	Pella Christain School	55.0
36	Spencer	Hospital	54.9
37	Dubuque	Eagle Pt. Pump Station (EPA)	51.9
38	Pleasant Hill	Sewage Treatment Plant	49.3
39	Dubuque	Fire Station #4 (EPA)	46.8
40	Fort Dodge	Municpal Water Plant	41.0

* A valid year represents a minimum of forty-five samples with at least nine in each quarter.

TABLE 4

RANKING OF VALID* HI-VOLUME SAMPLER SITES
BASED ON NUMBER OF TIMES SECONDARY 24-HOUR STANDARD WAS EXCEEDED
1976

Rank		Site and Location	No. of 24-Hour Samples Exceeding Secondary Standard
1	Keokuk	Water Pollution Control Plant	33
2	Des Moines	Industrial Park	22
3	West Des Moines	Water Works	17
4	Mason City	Water Plant	15
5	Cedar Rapids	City Garages	13
6	Grimes	Fire Station	12
7	Cedar Rapids	Jane Boyd Comm. Center	12
8	Cedar Rapids	Linn County Health Dept.	11
9	Clinton	Sewage Treatment Plant	11
10	Davenport	Ia. Highway Patrol Station	11
11	Des Moines	Fire Station #1	10
12	Cedar Rapids	City Garages (EPA)	9
13	Davenport	Ia.-Ill. Gas & Electric	8
14	Des Moines	Fire Station #8	6
15	West Des Moines	Crestview Acres	5
16	Denison	Municipal Water Plant	5
17	Olin	Fire Station	5
18	Des Moines	Fire Station #17	4
19	Des Moines	State Hygienic Lab	4
20	Altoona	Water Works Bldg.	3
21	Ankeny	Water Works Garage	3
22	Iowa City	Medical Laboratory Bldg.	3
23	Mason City	Water Tower	3
24	Mason City	Central Fire Station	3
25	Ottumwa	City Hall	3
26	Ames	Meeker School	2
27	Cedar Rapids	Noelridge Park	2
28	Davenport	Central Fire Station (EPA)	2
29	Davenport	Monroe School	2
30	Dubuque	Eagle Pt. Pump Station (EPA)	2
31	Talleyrand	Cochran Farm	2
32	Pleasant Hill	Sewage Treatment Plant	2
33	Rock Rapids	Municipal Utilities Bldg.	2
34	Bettendorf	Pleasant Valley School	2
35	Spencer	Hospital	2
36	Waterloo	County Courthouse (EPA)	2
		24-Hour Standard	
37	Dubuque	Fire Station #4 (EPA)	1
38	Muscatine	City Hall	1
39	Fort Dodge	Municipal Water Plant	0
40	Pella	Pella Christain School	0

* A valid year represents a minimum of forty-five samples with at least nine in each quarter.

VI. POLLUTANT STANDARDS INDEX

In August, 1976, the Environmental Protection Agency (EPA) published a suggested guideline for reporting an air quality index on a daily basis. This guideline was prompted by a study by the National Weather Service showing that of all the air quality indicies in use, no two were alike. The EPA therefore developed the Pollutant Standards Index (PSI) in an attempt to provide the public with a uniform guide to air quality.

The PSI incorporates five pollutants -- total suspended particulates, sulfur dioxide, carbon monoxide, photochemical oxidants, and nitrogen dioxide -- and a sixth variable which is the product of total suspended particulate and sulfur dioxide. The monitoring values for these pollutants are converted to a scale from 0 to 500. The National Ambient Air Quality Standard for each pollutant corresponds to PSI=100, and the Significant Harm Level corresponds to PSI=500. Table 5 lists the pollutant levels and corresponding PSI values.

During 1976, the Linn County Health Department was the only agency in Iowa using the Pollutant Standards Index. Air quality for Cedar Rapids is reported weekly using the index. DEQ began reporting a monthly PSI index to the Air Quality Commission in early 1977. An example of the monthly report is shown in Figure 2.

Figure 2 illustrates the Pollutant Standards Index in a bar-graph form. The appropriate index value corresponding to health and air quality levels is shown at the top of the graph. Twenty monitoring sites located throughout the states are listed on the left-hand side with pollutants monitored at those stations directly to the right.

Each monitoring site was chosen so as to get a good distribution of pollutants measured (e.g. TSP, SO_2, CO), geographic locations (e.g. Linn Co., Woodbury Co.) and land use type (e.g. argicultural, industrial, commercial, residential). There is also consideration given to the nature of the monitoring site as to its reflection of either very localized or broad-based effects. Generally sites which reflect a broader geographic area are favored for use in this list over sites which reflect a single strong source with relatively localized effects.

Monthly PSI values for carbon monoxide (CO) and ozone (O_3) are determined by taking the maximum 8-hour CO concentration and the maximum 1-hour O_3 concentration for the month and converting those values with the aid of Table 5. In calculating PSI values for sulfur dioxide (SO_2) and total suspended particulate (TSP) two criteria are used. If the maximum 24-hour average concentration exceeds the primary standard of 260 ug/m^3, Table 5 is used to estimate the PSI value. If the maximum value is less than 260 ug/m^3 the running yearly geometric mean for TSP and arithmetic mean for SO_2 is compared to Table 5 to estimate the PSI value.

Each PSI value for corresponding monitoring sites is plotted on the bar-graph to obtain a monthly interpretation of the air quality data.

TABLE 5. COMPARISON OF PSI VALUES WITH POLLUTANT CONCENTRATIONS, DESCRIPTOR WORDS GENERALIZED HEALTH EFFECTS, AND CAUTIONARY STATEMENTS[d]

INDEX VALUE	AIR QUALITY LEVEL	POLLUTANT LEVELS					HEALTH EFFECT DESCRIPTOR	GENERAL HEALTH EFFECTS	CAUTIONARY STATEMENTS
		TSP (24-hour), $\mu g/m^3$	SO_2 (24-hour), $\mu g/m^3$	CO (8-hour), mg/m^3	O_3 (1-hour), $\mu g/m^3$	NO_2 (1-hour), $\mu g/m^3$			
500	SIGNIFICANT HARM	1000	2620	57.5	1200	3750	HAZARDOUS	Premature death of ill and elderly. Healthy people will experience adverse symptoms that affect their normal activity.	All persons should remain indoors, keeping windows and doors closed. All persons should minimize physical exertion and avoid traffic.
400	EMERGENCY	875	2100	46.0	1000	3000		Premature onset of certain diseases in addition to significant aggravation of symptoms and decreased exercise tolerance in healthy persons.	Elderly and persons with existing diseases should stay indoors and avoid physical exertion. General population should avoid outdoor activity.
300	WARNING	625	1600	34.0	800	2260	VERY UNHEALTHFUL	Significant aggravation of symptoms and decreased exercise tolerance in persons with heart or lung disease, with widespread symptoms in the healthy population.	Elderly and persons with existing heart or lung disease should stay indoors and reduce physical activity.
200	ALERT	375	800	17.0	400[c]	1130	UNHEALTHFUL	Mild aggravation of symptoms in susceptible persons, with irritation symptoms in the healthy population.	Persons with existing heart or respiratory ailments should reduce physical exertion and outdoor activity.
100	NAAQS	260	365	10.0	160	a	MODERATE		
50	50% OF NAAQS	75[b]	80[b]	5.0	80	a	GOOD		
0		0	0	0	0	a			

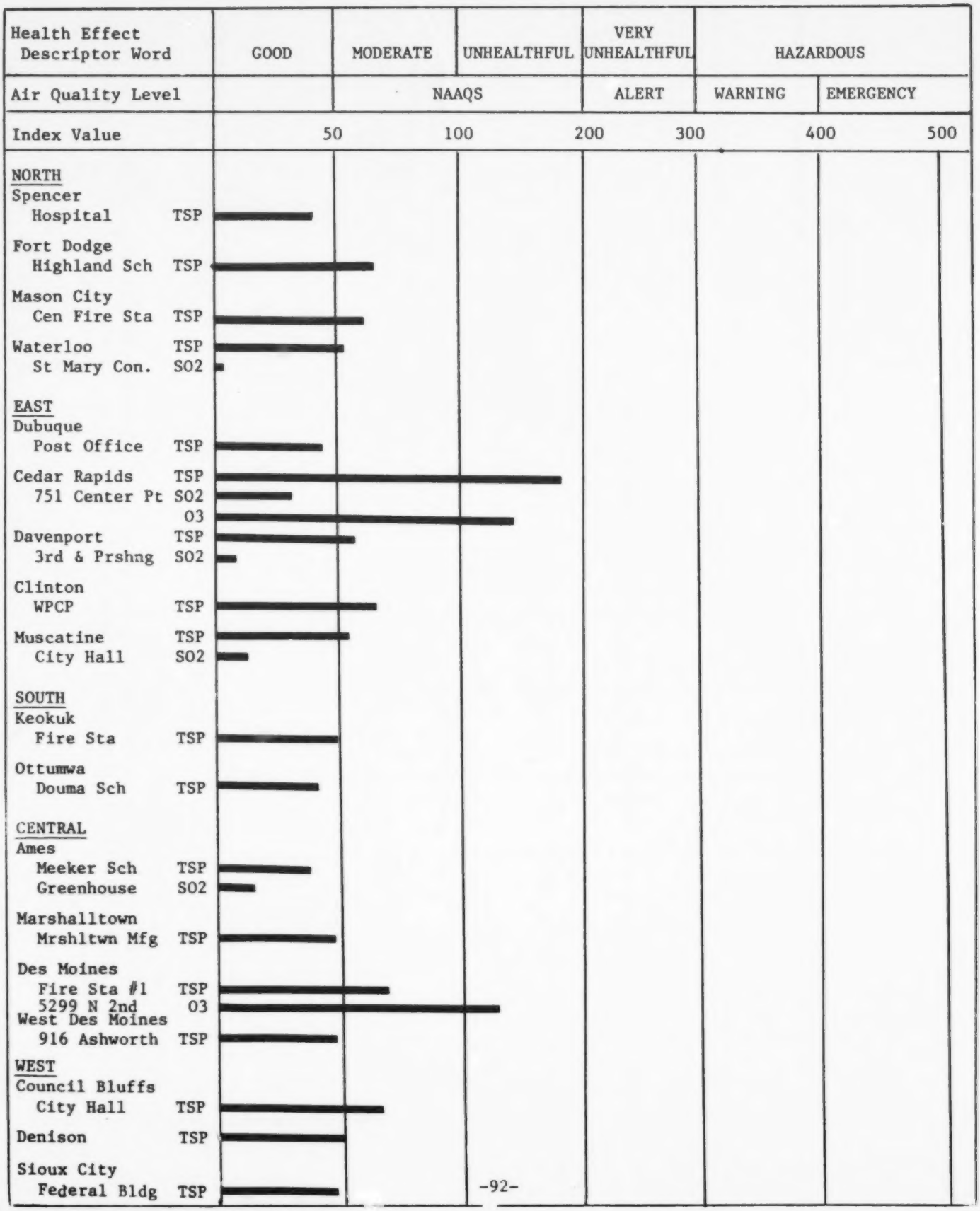
[a]No index values reported at concentration levels below those specified by "Alert Level" criteria.

[b]Annual primary NAAQS.

[c]400 $\mu g/m^3$ was used instead of the O_3 Alert Level of 200 $\mu g/m^3$.

[d]Source: "Guideline For Public Reporting of Daily Air Quality -- Pollutant Standards Index (PSI)", U.S. Environmental Protection Agency. OAQPS No. 1.2-044, August, 1976.

FIGURE 2
IOWA POLLUTANT STANDARDS INDEX



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15. SUPPLEMENTARY NOTES

16. ABSTRACT

Iowa's air monitoring data from 1959 to 1976 has been compiled in this report for seven pollutants monitored in the State: suspended particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide, hydrocarbons, photochemical oxidants, and sulfates. The data are presented in tabular form for each of the twelve Air Quality Control Regions in the State. To help the reader better understand the large amount of technical information in this report, additional sections discussing the pollutants and pollutant sources, the air monitoring network, and the analysis of data and trends have been added. Brief summary of another Departmental project, the development of a Pollutant Standards Index, is also included.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Monitoring, Carbon Monoxide, Hydrocarbons, Nitrogen Dioxide, Pollutant Standards Index, Sulfur Dioxide		

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